# ELECTRICAL REVIEW

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## Electric Light, Power, Telephone, Telegraph and Scientific Progress.

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## VIEWS, NEWS AND INTERVIEWS.

We are all familiar with those deceptive newspaper "ads." which start in with an account of an awful disaster at sea, and wind up with the assertion that "the survivors washed themselves ashore with cakes of Bjinks' Toilet Soap." This was a clever scheme at first, but it is wearing out, and "a burnt child dreads the fire." The skillful advertiser is now, it seems, turning his talents to using electrical features to attract the public's attention. The following paragraph recently appeared in a country paper as an innocent reading notice under the head of "A Disputed Question."

Scientists and electricians cannot agree upon the number of electric volts which are necessary to cause a cessation of life in the human body; some claim that an excessive shock is more likely to cause incineration rather than instantaneous death, but if they would turn their attention to prolonging and increasing the pleasures of life, the public would hail the result with more satisfaction. For instance, the electricity generated in a wave of laughter is after all the most pleasant shock, and to see a large assemblage moved by a current of uncontrollable mirth while witnessing the play of "She Couldn't Marry Three," places beyond dispute the fact that large volts of laughter are better than volts of electricity any day.

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Mr. Walton Storm, a member of the New York Board of Electrical Control, is said to have won $12,500 on the election of Cleveland.

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"Some years ago, when a dynamo was still a curiosity, I bought one and rented space in a small machine shop in Brooklyn where I wanted to carry on some experiments," said an elderly electrical engineer. "The terms for space were so much and I was to pay so much more for power from the line shafting to run my dynamo. When I got the machine set up, the proprietor of the shop came in to examine it. He turned the belt pulley around with his hand and of course the armature revolved freely as there was no load on the machine. 'Pshaw!' said he, 't'ain't going to take no power to run that thing; guess I won't charge you nothing for power.' I was surprised and pleased, as I hadn't any too much money to carry on my experiments with. When I got my dynamo to humming, I'll bet it took more power than all the other machinery in the shop."

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Mr. William Stanley, Jr., the well-known and talented electrician of the Stanley Electric Manufacturing Company, of Pittsfield, Mass., is building a $20,000 residence on Dawes avenue, Pittsfield.

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Bids for lighting the public thoroughfares, squares and the parks of New York city will be opened on December 8. Electricity will be substituted for gas in all streets where subways have been built and where the electric lights will be supplied as cheap as gas. Residents of the annexed district want the old naphtha lamps and gas lamps removed and electric lights put in. The Gas Commission has decided to put 200 additional electric lamps in the district east of Third avenue, north of 137th street and west of the Southern Boulevard.

The advantages of electric heaters for use in conservatories are thus enumerated: Absence of all unwholesome gases or vapors which might injure the plants, simplicity of construction in the parts conveying the energy, perfect safety as regards heat, which can be regulated at will, cleanliness and convenience, and rapidity in starting and extinction.

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The Post Office Department has under consideration some novel plans for the electric distribution of mail matter at the World's Fair, submitted by the United States Rapid Transit Company, of Chicago. The plan proposes cables high enough to clear all buildings between the points named, and on these cars would be sent by electric power at high speeds, and so arranged as to dump the mail bags at given points and return with other matter sent up in an elevator.

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Joseph B. Strauss, of Cincinnati, claims to have perfected an electrical signaling device by which firemen at a hose nozzle can communicate with the man in charge of the fire engine. Tests made by the Cincinnati fire department seem to indicate that the device possesses merit.

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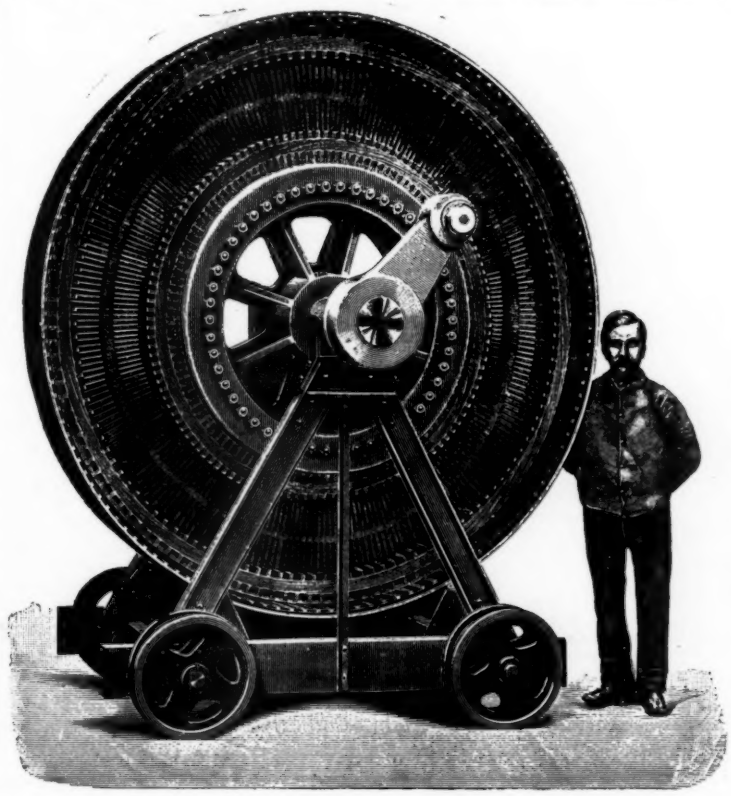
The new method of counting adopted by the Western Union and Postal Telegraph companies, in which three letters, figures, etc., constitute one word, will be found very advantageous to the public. Besides considerably reducing the cost of messages, it is an act of justice to which the public are entitled and should have been adopted long ago.

### A Large Dynamo Armature for Direct Driving.

In last week's issue of the ELECTRICAL REVIEW a dynamo with a rather novel armature, constructed by Fritsche & Pischon, of Berlin, was illustrated and described. The engraving on this page, which is from London *Industries*, represents a large Fritsche armature for direct driving, in which connectors are employed, and the armature strips proper are radial. The armature conductors are again connected up in series, and the method of coupling can be easily gathered from the illustration. We believe that Mr. Fritsche was the first to investigate the laws of the numbers of turns necessary to produce series winding in multipolar dynamos. The connectors in the radial armatures are, of course, copper, and as the iron conductors are naturally large in comparison, it is easy to fit the connectors in neatly. Messrs. Fritsche & Pischon, of Berlin, have now been manufacturing these machines for some time, and have made all sizes from 5,000 watts up to slow-speed direct-coupled dynamos giving 200 horse-power each for central station work.



A LARGE DYNAMO ARMATURE FOR DIRECT DRIVING.

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George N. Duffie, of St. Paul, representing the Northwest General Electric Company, was in Winona, Minn., recently, and closed an option which the company had on a large plat of property on the levee. Here will be erected an electric light plant 60x140 feet in size. This plant will cost in the neighborhood of $20,000, and will operate the electric street railway, which the company also controls.

## ELECTRIC RAILWAYS.

JOINT DISCUSSION OF THE PAPERS READ AT THE GENERAL MEETING OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, CHICAGO, JUNE 8, ON "SERIES ELECTRIC TRACTION," "A NEW SYSTEM OF ELECTRIC PROPULSION" AND "ELECTRIC RAILWAY MOTOR TESTS."

The seventieth meeting of the American Institute of Electrical Engineers was held at 12 West Thirty-first street, New York, October 25, 1892, and was called to order at 8.15 P. M., by President Sprague.

The President: There are three papers under discussion to-night—papers which were read at the Chicago meeting. The first is on "Series Electric Traction," by Mr. Nelson W. Perry; the second on "A New System of Electric Propulsion," by Mr. H. Ward Leonard; the third on "Electric Railway Motor Tests," by Prof. George D. Shepardson and Edward P. Burch. The discussion will be opened by Dr. Cary T. Hutchinson. There was practically no discussion at Chicago, on account of the limitation of time, and the discussion to-night should be as full as necessary to bring out either the merits or the faults of the systems.

Dr. Cary T. Hutchinson: I had not the good fortune to be at the Chicago meeting, and therefore do not know exactly how Mr. Perry's paper was received; but I must confess that when I found such a paper had been read I was very much surprised; I thought this plan had been abandoned by everybody long ago. I dare say there were not very many people there who were entirely familiar with the beginnings of the series system and with the curious claims that were put forward for it at the time. A little history does no harm now and then. I have before me a circular issued by Professor Short's company in 1888 which is really unique and which I think should be preserved. It is entitled: "Why is Electricity Not Used for Street Car Propulsion?" (Laughter.) The circular purports to give an account of the operating expenses of the three different systems of using electricity—the storage battery system, the divided current, parallel, or multiple arc system, as it was variously called, and the series system. There is very little use in going into the storage battery question. We have not sufficient data yet to tell us whether he is right in regard to that. But when he discusses the parallel system he makes some rather curious statements. I wish to read one or two. He says, among other things, that "the parallel system works under the following disadvantages:

"First. The well known law that the power lost on a conductor is proportional to the square of the current on that conductor; so if it cost one dollar per day to send current enough over a given conductor to run one car, to run two cars twice the current must go over this conductor, which will cost not two, but four dollars; for three cars it would cost nine dollars; five, 25 dollars, and for 10 cars, it would cost 100 dollars to force sufficient current over these wires to drive them."

If that had been true we should not have run any cars. There are several delightful assumptions in this. The first is that the size of the conductor is kept the same, irrespective of the number of cars. The second is that all the cars are bunched at the far end of the line, and the third is that the $C^2 R$ loss in the copper costs one dollar per day per car; as a matter of fact, it costs a good deal less than one cent.

Then a second disadvantage is that "A system of this kind is subject to a complete stoppage of traffic at any moment, by a wire falling across the two parallel conductors, and every car on the entire system would immediately come to a full stop and there remain until the wire is removed. In the

meantime, the generator at the driving station would have its armature burned or break its driving belt.

"Third. Upon this parallel system if a car was, for any reason, completely stalled, which is a common occurrence with street cars, either from an overload, being derailed or having the brakes set, and the current be then turned full into the motor, it would be immediately destroyed by having its coils burned out.

"In this system the motors have a large amount of power at or near the driving station, but the power falls very rapidly as the distance from the station increases, and upon comparatively long lines, the cars are scarcely able to move at the extreme ends of the line." (Laughter.) "Cars should have the same power throughout the entire length of the circuit, in order to allow them to run faster towards the outskirts of the city and make up their time.

"Each motor on a parallel circuit depends for its power and speed upon the movements of the rest of the motors on the circuit, making it vary in speed, and require constant attention from the car driver."

Touching another point, of which I may have something to say later in the evening, he says:

"The regulation of the motors operated on these parallel circuits is accomplished by means of resistance coils being thrown into and out of the circuit. As it always requires power to send a current through a resistance, these coils are, from their very nature, intended to be power dissipators, and therefore consume coal without returning any useful equivalent. They are the most unscientific contrivances ever devised by man, and cannot be permitted in any perfect system of electrical distribution of power. In addition, these resistance coils are dangerous, as they become very hot, and have often set fire to the woodwork of the cars." (Laughter.)

He says: "This system of distribution of electricity has been tried for many years in incandescent electric lighting, and has proved a financial failure (laughter) wherever many lights have been run upon circuits of even moderate length."

The gist of the paper is his calculation of the cost per day of running 20 cars on a ten-mile line. The only item, so far as I can make out, that he considers in calculating the cost of running the cars is the loss on the conductors. Of course, this cost, at $1 a day, counts up. He finds a waste of 1,455 horse-power in the conductors and 250 horse-power to be used in the cars; this requires altogether 2,450 indicated horse-power at the power house to run 20 cars. The cost of this is something like $25 a day for coal alone.

The series system has none of these disadvantages. It works at something like $2 a day. Of course, this all seems very ridiculous now, and at least one person knew it to be ridiculous then. Mr. Sprague at once wrote an article criticising it, in which he said substantially just what I have said. He told Professor Short that the thing was actually done, and that it cost only about $1 a day instead of $12, and required 200 odd horse-power instead of 2,500.

Referring to Mr. Perry's paper itself, if anybody has followed all those diagrams through carefully, as I have done, he must have seen that Mr. Perry has made an extremely ingenious arrangement of switches. As Mr. Perry himself says, the thing works beautifully—on paper. I might add that it never will work anywhere but on paper. Some kind of movable switches must be used, with magnets to open and close them, with two circuits on the magnets. Trolley wheels have to run on and connect three wires at the same time in many cases, making contact with all of them. These wires, of course, have to be insulated when the trolley wheel is not on them. Altogether the thing is extremely complex, and, I can say, absolutely impracticable. In addition to this, of course, there are the objections which apply to any and all series systems—very serious objections. In using a constant current one must vary the potential difference at the car; a car which would take 100 amperes at 500 volts, as many do, will, if run on 40 amperes, require 1,250 volts. As one cannot run a dynamo over 5,000 volts with any sort of decency, it is necessary to section the line. The sections must be so short that it is impossible for two cars to be on the same section at the same time. For city work, therefore, the sections must be very short, which means more of these switches.

Mr. Perry neglects completely what probably is the most important objection to the series system—that is, the motor itself. The constant current motor is a very different sort of thing from a constant potential motor. A constant potential motor can be run, of course, at double its nominal capacity for a short time, but when a constant current motor is at its point of maximum work—that is to say, when the brushes are in the maximum position—if the load is greater than that for which the machine is designed, it will at once come to a dead standstill. There is no margin of overload in a constant current motor, hence the machine must be built for the very greatest load it can ever possibly get. To regulate it one must vary the field or shift the brushes. Shifting the brushes causes sparking. One might shunt the magnetic circuit; but that means beastly magnetic design. Moreover, a series system is necessarily a double trolley system, and this of itself is enough to condemn it utterly, without regard to the numerous other objections cited.

Although it seems as if it were hardly worth while to resurrect this, yet certainly Mr. Perry does deserve a great deal of credit for the ingenuity with which he has worked it out. He has made a very readable article. It is well, however, to keep in mind that the only point at which it is even claimed the series system has the advantage is in the saving of copper. But the cost of copper, although a large item, is by no means the total cost, and even the reduction of the copper cost to one-half or one-fifth of its present value would not be such a great advantage as to counterbalance the other disadvantages which it entails.

The next paper is Mr. Leonard's, "A New System of Electric Propulsion." I think, however, I shall leave this until I have finished with the other paper, because some things I wish to say about the other paper will have a bearing on Mr. Leonard's.

The third paper is on "Electric Railway Motor Tests," by Professor Shepardson and Mr. Burch. These experiments were made apparently in the shops of one of the railway companies at Minneapolis. They are evidently made with crude apparatus, and as far as I can make out from reading the paper rather carefully, the conditions of the tests are not accurately specified. In many cases one cannot tell at what voltage the test was made. No attempt is made to note the temperature; that is to say, the resistance of the circuits at the time the efficiency was measured; altogether I should not regard them as of the very highest degree of accuracy. Nevertheless, I think the results he gives are in substantial agreement with others. He gives, on page 579, in Fig. 1, the curve of efficiency for the old No. 6 Sprague motor. The numbering of the clips is slightly different from what is usual; clip 2 would ordinarily be called clip 1. He has made his tests on all the clips, that is, 2, 3, 4, 5 and 7. As I stated some time ago, in an article I wrote, it is more than harmful, it is criminal carelessness, to use these switches on any but the first, fourth and seventh clips, the reason being that the sixth clip has the same number of ampere turns as the seventh and a very much higher resistance. The same is true of the third and fourth. One gets practically the same speed with the fifth, sixth and seventh, but a very much better efficiency on seven. Many roads run on the sixth constantly. They are afraid to use the seventh, so they stick to the fifth and sixth and run with a resistance of about 0.6 ohms more than there is any necessity for.

I have compared these tests of Professor Shepardson's with some which I published myself the other day;* they were published under my name, although they were really made by my company. These tests were all made by an electric method. We adopted this method after trying in vain to get consistent results from Prony brake measurements; we tried various forms of the Prony brake, but were unable to get satisfactory results; impossible efficiencies were frequent. Finally we gave up all attempts to make mechanical measurements, and used the electrical method altogether. This method demands very few simultaneous readings, only two, and allows the correction for temperature to be made very easily. That is, one can reduce all efficiencies to the standard temperature, so that the efficiency curve is given for the standard temperature. Tests, to be strictly comparable, should be made under some such conditions as this. The suggestion, by the way, to make these tests at a constant resistance, and the method of deducing the formula, which is not as simple as it seems, are both due to Dr. Duncan. It will be seen from these curves that the No. 6 Sprague motor has an efficiency of 83 per cent. at 20 amperes, falling to 80 per cent. at 35, and running down in the other direction to 80 per cent. at about 12 amperes. That is to say, between 10 and 35 amperes the efficiency at the armature shaft is above 80 per cent. The efficiency with gears from 35 to 15 amperes is pretty constant at about 75 per cent. This is a very much better efficiency and better results in every way than I have seen published for any motor, except some which apparently were distributed at the meeting of the Street Railway Convention in Cleveland the other day. These were of the Short Company's new gearless motor. Results are there given for four gearless motors, and one, if the curve is correct, is by all means the most admirable motor I have ever seen in the way of efficiency. It reaches a maximum of about 87 per cent. at 7.5 horse-power, and is practically constant to 14 horse-power. The curve crosses 80 per cent. at five horse-power and again at 21 horse-power, so the efficiency from five to 21 horse power would average about 83 per cent. This motor then has a very high efficiency at low loads, a feature greatly to be desired. We all know that the street car motors run for nine-tenths of the time at very low loads. A motor which has high efficiency at low loads and drops down even to 60 per cent. at full load is very much better than one that goes up to 80 at full load and drops down to 50 per cent. at a quarter load. Professor Shepardson calls attention to the fact that these results of his are not strictly comparable among themselves, for the reason that his voltage varied in the different tests. He gives tests which I think none of us can interpret—such as Fig. 2—for the reason that the different curves there are taken with either two-thirds or one-third, as the case may be, of a Thomson-Houston rheostat in series with the motor, the resistance of the rheostat is not stated anywhere, nor is there any means of getting potential difference at the armature.

*Electrical Engineer*, October 12, 1892.

Fig. 3 gives two rather interesting test curves of a No. 6 Sprague motor, showing how the efficiency at low loads can be raised by increasing the number of turns on the field; that is to say, by working at a greater excitation at light loads than is usual. This is rather interesting and would be a very good thing if it were possible to work in that way. But, unfortunately, it does not take speed into account, really the ruling consideration. It is often said that the commutated field method of working is absolutely wrong, because it gives the maximum number of turns at the very worst time. Professor Shepardson brings out that point and to a certain extent it is true. He makes one observation on page 585 which I think is extremely pertinent, and which everybody will have something to say about sooner or later; that is, that an average of 12 tests on a road showed that with two motors on a car it required 27 per cent. less current when only one is working. I dare say that most of us think that one motor is the proper thing now that motors can be so built that there is no longer danger of serious accidents. It is easy to see how the saving comes about. If from the current and torque curve of any motor one finds the current for a car under any conditions on the assumption of one motor and then on the assumption of two, the result will show greater current when using two motors. This means simply that the motors are working at lighter loads, and, consequently, at lower efficiency.

I do not think there is much to be surprised at in the load diagrams given in Figs. 8, 9, 10 and 11. Although it is said that when there is a large number of cars on a line the loads tend to equalize, nevertheless, on every road where I have watched the ammeter there has been an extremely large variation. I do not think that with any method of direct working a variation of 25 to 50 per cent. can be avoided.

There is another point which Professor Shepardson touches rather lightly on page 585. He speaks of the comparative value of the rheostat and "commutated field" methods of regulating. There have been two other papers published recently, one by Mr. Thorburn Reid, the other by Mr. Wellman, touching on that subject. Mr. Reid says the motor with the commutated field is much more efficient; Mr. Wellman says it is not. I rather wished to be convinced that Mr. Reid's argument was right; but I confess I could not understand it, and I could not make much more of Mr. Wellman's.

This matter has been argued back and forth for more than three years, but in this time no one, apparently, has thought of appealing to experiment to settle it. It seems to me that the matter can be definitely decided very simply, and to this end, that we may bear no more of the subject, I have prepared the following table, showing the case of

"COMMUTATED FIELDS VS. RHEOSTATS."

| C. | Position. | S. | $\varphi_1$ | $\varphi_2$ | $\varphi_3$ | $\varphi_1-\varphi_3$ |
|---|---|---|---|---|---|---|
| 20 | VII. | 9.1 | 84½ | .. | 84½ | .. |
| 20 | IV. | 6.3 | 69 | 63½ | 60 | 9½ |
| 20 | I. | 4.4 | 50 | 44 | 42 | 8 |
| 15 | VII. | 10.6 | 83 | .. | 83 | .. |
| 15 | IV. | 7.3 | 73 | 64 | 61 | 12 |
| 15 | I. | 5.4 | 59 | 48 | 45 | 14 |
| 10 | VII. | 13.8 | 78 | .. | 78 | .. |
| 10 | IV. | 8.8 | 75 | 63 | 60 | 15 |
| 10 | I. | 7.0 | 66 | 50 | 48 | 18 |

Here $\varphi_1$ is the efficiency of a No. 6 Sprague motor for the various current values and corresponding speeds taken from my tests referred to above; values are given for the three switch positions; $\varphi_2$ is the electrical effciency with rheostat for the same current and speed. This is calculated by reducing the electromotive force of the motor in proportion to the reduction of speed. The efficiency $\varphi_3$ is then the ratio of the reduced electromotive force to 500. This, of course, takes no account of hysteresis, eddy current and friction losses. Putting these all at five per cent., *i. e.*, taking 95 per cent. as the efficiency of conversion from electrical into mechanical energy, we get the column for $\varphi_3$; that is, $\varphi_3 = .95\ \varphi_2$.

It will be seen that in every case the commutated field method gives an efficiency higher even than the electrical efficiency with rheostat, and much higher than the best probable value of the actual efficiency.

This comparison is made with the same motor and involves no element of doubt. There can be no question that with these motors the commutated field is the more efficient, and it is very clear to me that it must always be so.

There is one other point I will speak of. Professor Short published on the 16th of April, 1892, in the *Electrical World*, an account of the practical operation of a gearless motor. This was either his first or second gearless motor. He shows as a contrast the efficiency of the double reduction motor on the armature shaft, on the intermediate and on the car axle. I am sorry those efficiency curves cannot be shown, but the net result is that the efficiency of his gearing is extremely low. He calls attention to it by saying, "You will find on going over these curves that the load varies considerably with the speed. You will find the efficiency is very low at heavy loads at slow speeds and rises to its highest at medium speeds and medium loads." Of course, in that particular case his object was not to make a very good showing for the double reduction motor. Now, taking that curve as he gives it, I find for a load of five horse-power on the Short double reduction motor, on Professor Short's own testimony, the efficiency of the gearing is 78 per cent. only. We found on the Sprague motor 78 per cent. At 10 horse-power his curve gives 74 per cent. as against our 92, and at 16 horse-power his gearing efficiency falls to 63 per cent., as against our 91. He cannot be right; it is absolutely out of the question that it should be so.

*(To be continued.)*

## A Rule That Works Both Ways.

Engineers understand very well the meaning of the old saying, that "A man who is his own lawyer has a fool for a client." Though this saying is open to the suspicion of having been invented by a lawyer for the benefit of lawyers, there is little doubt but that it contains an important truth, whether applied within the strict meaning of the words or in its broader sense, in which it means that he who is his own physician has a fool for a patient, and he who is his own engineer has a fool for a client, etc. Engineers are familiar with the fact that too many men, who would not think of making fools of themselves by becoming their own lawyers or their own physicians, never think of employing a disinterested engineer when they have engineering work to do.

Some things which have come under our notice, however, lead us to think that there are engineers who sometimes forget the value and economy of expert service and advice where anything is to be done involving important interests. Engineers frequently enter into contracts with manufacturers and others for services or supplies of various kinds, and it frequently happens that trouble arises from the fact that the written contract is found, upon being tested in the courts, not to be what the engineer party to it supposed it was. It is quite easy to draw a contract which shall seem to the uninitiated to be very strong, and to leave no loophole through which either party can escape from his obligation in case he should wish to do so, and yet have it, as has proved to be the case many times, so worded as to make it easy to "drive a four-horse team through it." More than one engineer who has supposed that he had an "iron-bound contract" with a company, relating to his employment in a responsible position, has found to his sorrow that his continued employment during the term of the contract, his salary, or his allotment of stock, has been made to depend upon some innocent looking provisos or contingencies which leave him utterly without recourse or legal standing in case there is trouble or misunderstanding of any kind.

The best use to which a lawyer can be put is not, as commonly supposed, the getting us out of difficulty, when we have gotten into it, but in keeping us from getting into difficulty, and there is probably no better way of having him do this than by having him draw contracts that are real contracts, whenever important interests are or are likely to be involved.—*American Machinist.*

## ELECTION RETURNS.

**The Long Distance Telephone Announces the First Authentic Figures—Splendid and Accurate Service Rendered—The Western Union Bulletins Better than Ever Before—Search-Lights Throughout the Country Signal the Results.**

It is useless to tell the readers of a weekly paper how the democratic avalanche swept down upon and smothered the Grand Old Party on Tuesday, November 8. The readers of the ELECTRICAL REVIEW being of a scientific turn of mind, had, many of them, figured and prophesied in advance, and many of them have been figuring since Tuesday to discover "how it all happened." It has happened, and while it is no part of our purpose to discuss the political situation, we think every one will be interested in knowing a little of how it happened—at least that part played by the long distance telephone, the telegraph and the electric search-light, in announcing the returns.

The recently completed New York-Chicago telephone line, together with other long distance circuits throughout the country, owned and operated by the American Telephone and Telegraph Company, gave to that company unusual and unprecedented facilities for obtaining election news from a large extent of territory, and the very important advantage of its direct transmission by word of mouth. During the presidential campaign of four years ago the local telephone lines and the long distance circuits as far as then completed were important factors in the transmission of election returns, but the feat just accomplished with extended facilities beats all previous records made by the telephone, and is added evidence of its value on great and important occasions when instantaneous communication is demanded. To General Superintendent A. S. Hibbard, of the American Telephone and Telegraph Company, is due the credit of the simple and ingenious plan of operation which worked so successfully. Mr. Hibbard's plans were made but a few days in advance, and were so perfectly thought out that not a single deviation from the original scheme was necessary.

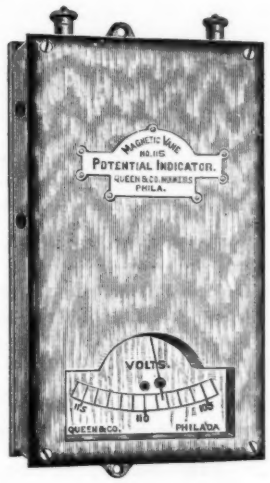
Starting from the long distance telephone offices at 18 Cortlandt street, New York, as a central distributing point, "outward" and "inward" telephone lines were arranged between other important points. The local telephone exchanges and special long distance operators worked in harmony with the system, so that accurate returns were obtained from 88 of the large cities of the country. The territory covered included all of New England, most of the Middle States, Wilmington, Washington and Baltimore on the south, and Chicago and the State of Wisconsin on the northwest.

Mr. Hibbard confined his forces to securing accurate and reliable returns as early as possible from States and cities in doubt or of special interest. Complete and exact figures were features of the long distance bulletins. About 380 bulletins in all were sent out from 18 Cortlandt street. The figures for the bulletins were secured from newspapers, police headquarters and other official sources. The long distance reports gave the very earliest returns from New York city, Kings county, Illinois and Connecticut. In many cases a long distance operator was stationed at every voting precinct.

The extensive long distance telephone offices at 18 Cortlandt street, on election night, looked more like the offices of a great newspaper than those of a great telephone company. To be sure, telephones were everywhere apparent, and this scene may be but the forerunner of the time when the telephone with its advantage of instantaneous communication will replace to a large extent the telegraph as a means of news transmission. Extending down a narrow corridor outside the offices were 28 long distance cabinet sets, each with its operator and a big sign over it, such as "Buffalo Inward" or "Chicago Outward," indicating the connections and special use of that instrument.

The doors of all the offices were taken off their hinges, so that the many messengers carrying returns from one office to another had free paths to travel. As fast as messages were received, they were delivered to Mr. F. J. Hovey, who sat at one side of a big desk, located centrally with reference to the other offices. He collected the messages from similar points and passed them across the desk to Mr. W. A. Hovey, who edited, condensed and "boiled them down." Sometimes four or five messages were embodied in one bulletin. The edited reports were then sent to other operators, who transmitted them to all points embraced by the system.

Ingeniously contrived temporary switchboards enabled any desired combination of




QUEEN'S POTENTIAL INDICATOR.

instruments to be quickly made. An incandescent lamp was suspended over each telephone instrument, and others over the switchboards, so that there was plenty of light to work by.

The bulletin service was utilized in hundreds of places in this vicinity, all the prominent New York and Brooklyn clubs receiving the returns. At the Manhattan Club the returns came in so quickly that their accuracy was doubted, and when, later, the telegraph confirmed the telephone, three cheers were proposed and given for the Long Distance Telephone Company. A large number of members and their friends received the bulletins at the Electric Club in this city, and were loud in their praises of the service. The Montauk Club in Brooklyn was also an important rendezvous for people who wanted exact figures.

The rapidity of the service is shown by the fact that, at Albany, the telephone bulletins were received 55 minutes ahead of the telegraphic reports, and at Auburn, N. Y., the telephone beat the telegraph by one hour and a half.

A long distance operator was stationed at every place where returns were furnished, and as fast as they were received they were written down in crayon on white sheets of paper about 12 by 18 inches in size, at the top of which was printed "Long Distance Telephone Bulletin." The telephone company also furnished its patrons with printed cards showing the vote of previous years and provided with blank spaces for this year's returns. The service rendered by this means was most admirable, and great praise should be accorded to the American Telephone and Telegraph Company for its enterprise, and to Mr. Hibbard for his able and ingenious invention and management of the system of collection and distribution.

The service of the Western Union Telegraph Company in the handling of the returns of the election was exceedingly prompt and efficient, and the results were made known sooner and were more generally correct than ever before, notwithstanding the heavy increase in the vote cast. The Associated Press had 20 special wires placed at their disposal, and the Western Union Company had about 400 extra operators scattered through the various election districts in New York.

The main difficulty experienced by the company in getting accurate information arises from the fact that the method of gathering the returns varies in the different States, some of them being apportioned into districts and others into towns, townships and counties. In addition to this, considerable partisan feeling creeps into the reports, and a tendency is often shown in the absence of positive information, to color the reports according to the sentiments of the sender.

It is no small undertaking to sift the immense bulk of matter so received and distribute it in an intelligent manner, and, considering all the difficulties under which the telegraph company labors at such a time, they certainly deserve great credit for the promptness and accuracy with which the matter was handled.

The electric search-light was also brought into play to give the hungry thousands news of the great political battle. Here in New York the *Herald* utilized the search-light on the tower of the Madison Square Garden. When its beam of light shone toward the south it meant that New York had gone for Cleveland, and when the beam illumined Brooklyn it was thought that Cleveland was certainly elected. If New York State had gone for Harrison, Harlem would have been illuminated, and if Harrison had been reasonably sure of carrying the country, the darkness of New Jersey would have been pierced by the penetrating pencil of light.

The New York *World* equipped its dome with vertical bands of high candle-power incandescent lamps just before the Columbian celebration. These lights were of different colors, and a code of signals depending upon the colors shown was arranged and utilized for signalling election returns.

The Chicago *Herald* also used search-light signals, as did many other newspapers throughout the country.

### General Electric Company's New Cut-Outs.

Improvements in the manufacture of the smaller electrical appliances keeps pace with that of the larger and more important devices, each moving toward perfection. We here show some improved pieces of wiring apparatus which the General Electric Company has just brought out. The old style porcelain plug and link circuits have disappeared and the new ones here shown take their places as substitutes of greater efficiency. They are made of hard white, thoroughly vitrified porcelain, impervious to moisture, and impassable to the electric current, the metal parts possessing all the qualities necessary to render them electrically efficient. The plug cut-outs are designed to protect a circuit having a maximum current of 30 amperes at 125 volts. The fuse is carried in a small glass plug, cased and covered with brass, which is screwed into a brass screw socket in the body of the cut-out. Should the fuse blow, the defective plug can be instantaneously replaced, without tools of any kind.

GENERAL ELECTRIC COMPANY'S NEW CUT-OUTS.

In the link cut-outs the fuse is a safety link with copper terminals. The binding screws and wire terminals are set well below the surface of the cut-out, and are protected by suitable sheet mica covers. The porcelain of which these cut-outs is manufactured is itself made by the General Electric Company at its own porcelain factory at Schenectady, established in order that the quality of this important material should be of the highest possible standard of excellence.

### Queen's Potential Indicator.

We illustrate herewith a new potential indicator which Queen & Company, of Philadelphia, are placing on the market. It is built upon the general plan of their magnetic vane voltmeter, and is mounted in a handsome mahogany case with open scale divisions, so that very close readings can be made.

No permanent magnets or other parts which change with age are used in construction, so that constancy is assured. This is a very essential feature, as most instruments require frequent calibration—an item of considerable expense as well as annoyance.

The indicators as kept in stock are adjusted for 110 volt circuits, but special ranges will be made to order. They are adapted for isolated plants and central stations. Queen & Company are just issuing circular No. 395, which contains prices and full particulars.

The Wisconsin Telephone Company's loss, due to the recent great fire in Milwaukee, will not exceed $5,000, and probably will not reach that amount. Thirty-six telephones were burned up, all of the overhead wires in the lower third ward were destroyed, and also a storage shed near the gas works, together with a lot of poles. The fact that the underground service extends through the burned district prevented a great deal of damage and inconvenience, for otherwise the whole southern portion of the city would have been cut off from telephonic communication by the fire. The Chicago long distance line was temporarily cut off, but an emergency cable was laid from the foot of Washington street to the southern limit of the underground service, and the lines are now all operating as though nothing had happened. The high wind on the night of the fire did a great deal of damage to the lines of the company. While the fire was in progress a remarkable number of calls were received at the central telephone station, and the operating room was a very busy place.

The telephone line between Dresden and Zanesville, Ohio, is to be torn down and a new one is to be built by the way of Newark.

## Electricity and Conjuring.

HOW PROFESSOR HERMANN USES "THE FLUID" IN HIS FEATS OF MAGIC.

BY JULIAN A. MOSES.

The French Government, in the year 1856, found that in Algeria the natives were being incited to rebellion by the pretended miracles of their priests. Robert Houdin, the most celebrated conjurer of the time, was invited by the Government to visit that colony and try to outdo the native fakirs and conjurers. He finally succeeded, after many amusing experiences, in quelling the revolt, through the superstitious fears of the natives. He employed electricity in many of his feats, and in one particular he used a chest which had an iron plate in the bottom. This chest he placed upon a box in which was concealed a powerful electromagnet. By means of a simple, hidden device he controlled the current with his foot. He declared that he could, at will, make the strongest man a weakling. Several powerful natives were invited to lift the chest when the current was turned on, but naturally they did not succeed. Houdin called up a little boy. Secretly breaking the contact, the child easily lifted the chest. The native conjurers confessed themselves outdone. At the present time we have but few good conjurers in this country.

Wishing to learn what is accomplished by electricity in this art, I resolved to "beard the lion in his den," and interview Professor Hermann.

I must confess that it was not without a certain feeling of awe that I presented myself at the little latticed window, presided over by a corpulent Cerberus, and handed that gentleman my card, upon which was written: "The ELECTRICAL REVIEW would like to interview Professor Hermann concerning his wonderful applications of electricity to his profession." After some time the Professor appeared.

"Really, I am very busy," said he, "and you must excuse me, for I have an appointment at this hour, so I must leave you; but, before I go, I will introduce you to a gentleman who knows more about the subject of electricity than I do, for he has been with me ever since I started in this business."

The Professor then introduced me to this gentleman, who proved to be his business manager. My confusion nearly overcame me, for I imagined that now I was to be initiated into the wonderful mysteries that are nightly performed in the little Temple of the Sphinx on Broadway. My mind's eye pictured to me quantities of the electric fluid under the controlling thumb of the mighty Hermann, and information seemed to be hanging in festoons from all parts of the business manager. Thinking that it would only be by strategy, if anything, that I could obtain the much coveted information relating to the use of electricity for conjuring, I put on my most insinuating manner and prepared to interview.

"I have seen your card," said he, "and I presume that you want to interview me concerning the electricity that we use."

"You have guessed correctly," I responded; "that was my purpose in coming to see Professor Hermann."

"Well, you know that we use electricity all the time, and some of our most important tricks are done with the fluid. Hermann has a watch—I am sorry I can't let you see it, but it is so valuable that he never lets it leave his person, except when he has it locked up at home. It is a wonderful piece of work. It is not exactly a watch, but nothing more than a powerful machine capable of generating about one horse-power of electricity, very ingeniously contrived and concealed in the case of a watch."

Imagine my surprise when I heard that there was such a machine in existence and that the ELECTRICAL REVIEW had heard nothing about it. Would it be possible for me to see that machine and get a photograph of it, I asked.

"No," he replied, "the Professor never lets any one see it now, but I can give you a description of it."

As I thought it would be a pity for the world to lose such a wonderful piece of mechanism, should any accident happen to it, I prepared my note book to write an accurate description, so as, from the word picture, to make a working drawing.

"In the first place, the machine was made in Europe—they can't make such things here—and it is guaranteed to give only one horse-power, but I really think that it will give much more. Of course, you understand, it has never been used to give more, but I really believe that if it were put to the trial, one horse-power of electricity would be the minimum amount evolved. But I suppose that you are anxious for the description of the works. Inside of the case is an armature, some coils of wire, a few magnets, a lode stone—I suppose that you know what a lode stone is?"

I signified in the affirmative.

"Then there are some push buttons, a dial with some numbers, some switches, and a few other things, and that's all that I can remember about what is inside of it, but I suppose that I have told you enough to enable you to understand the workings of this wonderful watch."

"You say," I asked, "that all those things are in the inside of that watch case, and that such enormous power can be obtained from such a small thing?"

"Yes," he answered, "and I doubt whether the instrument could be replaced if it were lost."

"How is the current carried from this powerful machine?"

"Oh, that's easy enough. You know that ordinary people use wires for carrying the current, but Hermann does not; he uses black silk threads, and when he wears trousers of the same color and has a black carpet upon the stage, it is impossible to see them. The current goes through these threads, and he can do marvellous things upon the stage while he is in the audience, and no one suspects that he is doing anything."

"This is truly wonderful," I answered. My eyes are daily opened to new wonders. But I had a doubt in my mind at that time, whether the horse-power that the gentleman referred to was a hobby-horse or a clothes-horse power. Up to the present moment I have not as yet decided.

"Are many of his tricks done by the aid of electricity?" I again asked.

"Why, his most wonderful tricks are done by the aid of the fluid. Have you seen 'Cremation?'"

"No."

"Well, how could that be done without the aid of electricity?"

"Not having seen it I cannot say."

"Have you seen 'Ya-Ko-Yo?'"

"No."

"Well, how could that be done without the aid of electricity?"

I again confessed my ignorance of the manner of performing the trick.

"Don't you see? How could we do without electricity? It would not be impossible, but it would be extremely difficult. The fluid is of the greatest assistance to us. In some of our tricks we could not do without the telephone. For instance, in one of Hermann's séances, he holds a photograph at one end of the telephone while he stands in the orchestra, and a reproduction of the photograph is seen on the stage in midair. You know that this transmitting of images by means of the telephone was invented by Garner, and we have used it in many of our tricks."

"Have you ever seen this instrument?" I asked.

"No," he answered, "But there used to be one of them in the theatre. It was a wonderful instrument, and astonished all who saw it."

"Then you say that a 'telephone for transmitting images' has reached a state of perfection. I wonder that Professor Hermann has not placed it upon the market and realized a fortune."

"That's just it. I have told that to the Professor. But you know what these magicians are. If they would show these things to the public they would cease to be of interest to the large audiences that he draws nightly. And it is this diffidence that has kept many great inventions from the world."

"I did not know that the Professor was an inventor."

"Yes, indeed, he has invented many wonderful things, but he has kept them all to himself."

"Is there anything else electrical of interest, of which you can tell me?"

"I am sorry that I cannot take you behind the scenes, for we have the most complete system in the world for lighting our theatre. Every light can be turned on and off, and there are push buttons and switches everywhere. The stage is a perfect network of wires, and you cannot look anywhere without seeing them hanging in all directions."

"It is truly wonderful. I am greatly obliged to you for your interesting information. Good afternoon."

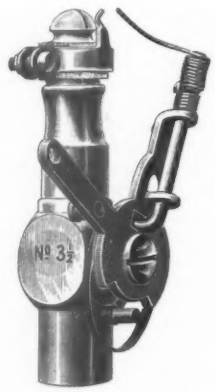
I walked out into the busy thoroughfare, thinking that great are the uses of electricity, and fully agreeing with Shakespeare, that

"There are more things, in heaven and earth, Horatio,
Than are dreamt of in your philosophy."

## The By-Pass Ratchet Gas Burner.

The Electric Gas Lighting Company, of Boston, has recently produced the improved electric lighting gas burner illustrated herewith. It is a by-pass ratchet burner, and the illustration shows it in full size.

Only one contact is made in four operations of the movable arm forward and back to light and extinguish the gas. This not only saves 50 per cent. of the battery power, but preserves the wire spring from heat and smoke, and so prevents grounds at the contact points, which are always kept clean. The burner has an amply large gas-way, into which is inserted a perfect working gas-check, which prevents hissing. It will interest users to find a ratchet hand-lighter




THE BY-PASS RATCHET BURNER.

whose movable electrode cannot be held in the flame until softened and robbed of its tension. The electrode is not lifted over the fixed one through the flame, but passes under and out of the flame instead.

The Electric Gas Lighting Company has recently issued a circular in which they state that they were the first company to supply the trade with superior burners as far back as 1887, and that since that time they have made and sold three-quarters of the electric gas-lighting apparatus used in the world. This company own valuable patents on their apparatus, and have always vigorously defended themselves from infringers, a policy which they inform us will be thoroughly maintained in the future.

## Of Course, It Would.

"Telephone girls in Chicago look black over an order to dress in uniform of that sable color," said the Judge.

"No wonder they object to black. Yeller would be more appropriate for a telephone girl's uniform," replied the Major.—*Pittsburgh Chronicle-Telegraph.*

## ELECTRIC LIGHT FLASHES.

Visalia, Cal., is to have electric light by January 1.

The electric light plant at Bennington, Vt., is to be again enlarged.

Earlville, N. Y., with only 750 inhabitants, has an electric light plant.

The Edgerton, Wis., Electric Light Company is stringing a line to Fulton, a distance of twenty miles.

The new power house of the Wichita, Kan., Gas and Electric Light Company is nearly completed.

The property of the Green Island, N. Y., Electric Light Company has been mortgaged for $25,000.

The Pittsfield, Mass., Electric Light Company is about to add $10,000 worth of machinery to its plant.

The prices of electric lighting at Aspen, Colo., have been reduced from 40 to 60 per cent. of former prices.

The Electric Light and Power Company, of Tucson, Ariz., have let a contract to the General Electric Company, of New York, for their plant in Tucson, and expect to have it in operation by January 1.

The old plant of the Brookline, Mass., Gas Light Company, on Brookline avenue, is now used only for electric lighting, and being a valuable asset will be sold in the near future, and the proceeds applied to a mortgage sinking fund.

W. A. Dunshee is the purchaser of the plant of the McKeesport, Pa., Electric Light Company, and the price paid is said to have been $55,000. Mr. Dunshee is said to represent the Citizens' Passenger Railway Company in the deal.

General Manager Chas. R. Huntley, of the Buffalo General Electric Company, says that some one, evidently with expert knowledge, is tampering with the lamps and lines of his company. A reward of $50 has been offered for information leading to the detection of this person.

The electric light station under course of erection by the Pennsylvania Railroad Company, near the Pittsburgh Union Station, is nearing completion. The track will be lighted by it from Pittsburgh to East Liberty. Another plant will soon be built at Walls, and the tracks will be lighted by it from that station to East Liberty.

At a recent meeting of the Newport, R. I., Electric Light Company, Cornelius Vanderbilt, Louis L. Lorillard and Theodore A. Havemeyer, the sugar king, were among the directors elected. This concern furnishes power for the electric cars which were the cause of a bitter row between the cottagers and the townspeople. The strongest objectors to the cars are now the controlling power in the electric light company.

It was rumored at Newark, N. J., last week, that a consolidation of the Newark Gas Light Company, the Citizens' Gas Company and the Newark Electric Light and Power Company is under way. Some of the stockholders admitted that there is some truth in the story. It is known that the gas companies have paid fair dividends and each has exclusive territory in which the other's mains have never been laid. Members of the Electric Light and Power Company denied that they are a party to the proposition, but Superintendent Jackson said that he had no doubt a consolidation will be effected in time. The three companies mentioned comprise all the lighting companies in Newark.

The Seattle, Wash., Gas and Electric Light Company has filed at the office of the county auditor a mortgage to the Minneapolis Trust Company for $1,000,000 on all its property and franchises. The mortgage is to secure 6 per cent. 20-year first mortgage bonds, which the board of trustees decided to issue at a meeting held on October 15, and the proceeds of these bonds are to be applied to the discharge of all liabilities, especially paying off loans raised for the purchase of the plant, and securing means to provide necessary additional equipment, extensions and betterments. Of the total, $750,000 are to be issued presently and the remainder from time to time. An accumulative sinking fund to redeem the bonds is to commence on July 1, 1897, consisting of two per cent. on the aggregate amount issued.

## LETTERS FROM A LABORATORY.—XXI.

BY JULIAN A. MOSES.

It is often necessary to solder together small pieces of apparatus that are not of sufficient size or of such a shape as to be conveniently held, either in the fingers, forceps or wires. Special devices are sometimes made when there are numbers of the articles to be soldered. But for one piece of work too much time would be lost in making clamps, etc., so the following expedient may be resorted to in order to save time and safely accomplish the soldering. At the place where the joint is to be, press the two pieces of metal into a mass of bee's-wax of sufficient size to hold them in position. While the wax is cold they can be delicately and accurately adjusted to any position that you wish them to have. Make a cement composed of equal parts of plaster and pumice stone, or plaster and fine white river sand, and pour this into sufficient water to make the mass of the consistency of cream. The articles to be soldered should now be laid upon a piece of paper and the plaster and sand poured over them, leaving the wax covered joint exposed. If considerable plaster is used the heat generated by the "setting" will be sufficient to soften the wax, which should be immediately separated from the metal. If, however, the heat is not sufficient, wait until the plaster is completely set, and then immerse it for a few moments in boiling water. This will surely soften the wax and permit of its easy removal. The pieces of metal will now be found to be held perfectly in their original position, and the process of soldering may now be commenced.

The different fluxes used are solely for the purpose of preventing the oxygen of the air from attacking the surfaces of the metals while they are heated, in which condition they are more easily oxidized. It would be advisable to have at hand bottles containing the following substances, to be used as fluxes for soldering. A solution of zinc in hydrochloric acid, diluted with one-quarter of its volume of water—dry borax, sal ammoniac and powdered rosin. A chemical change takes place where zinc chloride or sal ammoniac is used, while borax or rosin, under the action of heat, simply forms a varnish or film through which the air cannot pass.

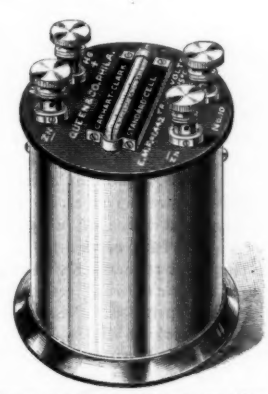
Soldering blocks may be made by imbedding willow charcoal in a mass of plaster moulded so as to rest solidly upon the table, or by compressing shredded asbestos into convenient forms. The usual methods of soldering are well known, but there are some processes which may be valuable to the experimenter, with which he is probably unacquainted, *i. e.*, the soldering of glass to brass or copper. Dial plates for galvanometers, scales for different electrical devices, or, in fact, any graduated surfaces of instruments, where parallax is to be avoided in the readings, may be made of mirrors. These mirrors may be fastened to the brass plate, by some cement, such as Canada Balsam, or ordinary spirit varnish. But the occasion may arise where it is necessary to have the mirror surface in direct contact with the brass plate, without the intervention of a non-conducting surface, which will not withstand heat. If such were the case it would be necessary to solder the glass direct to the plate. The following is the process: Lay the well cleaned glass to be coated in a shallow iron pan, having previously covered the under side of the glass with a paste of chalk and water. Gradually heat it to a temperature a little above that of melted lead. In a crucible melt a quantity of lead, and when in a fluid condition pour it upon the glass, rocking the pan backwards and forwards until all of the glass is covered by the lead; pour off the superfluous metal, and allow the glass to cool slowly. When entirely cold it may be soldered to the brass plate, taking due care to heat it gradually, remembering that behind the coating of lead there is a fragile piece of glass, and any sudden application of either heat or cold would tend to crack it. Thus, the lead coming in absolute contact with the glass, a perfect mirror results. In case it is not permissible to use heat for applying this mirror surface, the process will be made longer and not as satisfactory. However, it can be done by the method practiced by the mirror makers, who cover the glass with a sheet of tinfoil and pour mercury over it. An amalgam is thus formed, which in time hardens, under pressure, and presents a surface which can be soldered upon. A soft solder must be used, being careful to select one that will not crystallize upon cooling.

In electrical work it is advisable to use borax or rosin, as the fumes from the zinc chloride are apt to corrode any neighboring pieces of apparatus. In using borax care must be observed at the instant of applying the flame of the blow pipe, as the rush of the ignited gas and air will blow it away, and allow very little to remain upon the surface of the piece of work. To overcome this, in a measure, the borax may be moistened with a little saliva, but this is objectionable, for the flame, heating the water, boils it and causes jets of steam to issue from the mass. A soldering material, known as "Rynear's Gold Flux," which, I believe, may be obtained from dealers in jewellers' and dentists' supplies, does not possess this objectionable character, but remains upon the surface when the flame is applied.

### Carhart-Clark Standard Cells.

The accompanying illustration shows a new form of the Carhart-Clark cell with thermometer permanently attached. This type is well and favorably known to scientists both here and abroad, but for the benefit of those who may not remember all of its special features we give the following brief description:

The Carhart-Clark standard cell is the result of several years' study devoted to the subject of standard cells by H. S. Carhart, professor of physics and electrical engineering at the University of Michigan. Recognizing the fact that all known forms of



CARHART-CLARK STANDARD CELL.

standard cells had but small endurance and could not, in the least, stand the jars and strains of transportation without permanently destroying both accuracy and constancy, Professor Carhart, about five years ago, started out on a basis of Lord Rayleigh's experiments in standard cells, with a view to making a cell having no local action, perfectly sealed, giving a uniform and constant electromotive force for all time and which should not be injured by transportation.

After over two years' study and trial, Professor Carhart in the early part of 1889, completely solved the problem. The Clark cell, as is well known, is composed of zinc and mercury as electrodes and mercurous sulphate and zinc sulphate as salts. Great difficulty has always been found in securing the ingredients in a pure state, the smallest amount of foreign matter being sufficient to destroy the reliability of the cell. Another great trouble has been that in transportation the mercury would be so shaken through the other salts as often to cause a short circuit. The first of these difficulties Professor Carhart has overcome by making his own chemicals, the second by the use of a special device, so that any short circuit in transportation is practically impossible.

One of the chief points of the Carhart-Clark cell is its very low temperature co-efficient. By a method discovered only after long and laborious investigation, the temperature co-efficient has been reduced from 0.08 per cent. per degree C, to about 0.03 or from 0.00077 to 0.00039, thus making for all practical purposes the temperature change inappreciable. Each cell has, inside of its mounting, an extra graphite resistance of about 10,000 ohms, so that no particular injury will result should it be accidentally short circuited for a short time. The cells proper are prepared by Professor Carhart at his laboratory in the University of Michigan, and are furnished with his own personal certificate of accuracy, which also states the exact electromotive force, at 15 degrees C, and the temperature co-efficient of the cell.

Queen & Company, Philadelphia, who prepare the mountings for the above, have issued a descriptive pamphlet No. 325, which, along with other information regarding the cells, contains reports of some exhaustive and very flattering tests. A copy can be obtained from them for the asking.

### An English View of the Incandescent Lamp Situation.

The Edison lamp decision does not seem to have affected either the stocks of the companies interested or the business which they are doing. The Westinghouse people, however, claim that they have a new lamp, which they will put on the market on December 1, which does not infringe the Edison fundamental patent, and for which they now announce that they are ready to take orders and make contracts. No official announcement has been made of what policy the General Electric Company will pursue in dealing with the smaller lamp companies, but probably the management is wise enough to foresee that it will be more advisable to compromise on the payment of a small royalty than to shut up the factories of these companies. At any rate, such seems to be the general impression.—*London Electrician.*

### Mechanics' Fair Exhibit.

Electricity and electrical supplies occupy a prominent position among the exhibits at the Mechanics' Fair, now open in Boston, Mass., and among the well-known firms represented there are the Mason Regulator Company, the Jarvis Engineering Company, Westinghouse, Church, Kerr & Company, the Brown & Sharpe Manufacturing Company, the Page Belting Company and the American Tool and Machine Company. These concerns all have a good display of their leading specialties, and the combined showing is one of considerable interest. Another interesting electrical feature is to be found in the cooking department, where exhibitions in this line are given both day and evening. The appliances are extremely simple, but do the work in a most satisfactory manner, and demonstrate the entire feasibility of the system for domestic use.

### Electrical Nomenclature.

Mr. Mordey did good service by introducing the term "alternator," and in the United States they require an equally good word to use for "direct-current dynamo." "Director" seems to the point, except that it might be considered a slight upon a machine to associate it in any way with the manipulation of limited companies. We also think the plural of dynamo should be "dynamoes," as there is no reason why it should be made an exception to the ordinary rules of orthography. Similarly the plural of "henry" should be "henries." These are all questions of convenience and the survival of the fittest. Dynamotor, a very convenient word, is rapidly coming into use. It is shorter than "direct current transformer," and runs better than "motor dynamo" or "dynamo motor." It is also made up of two languages, in defiance of elementary philology, and thus agrees with many other electrical terms.—*London Industries.*

## ELECTRIC RAILWAY AND POWER NOTES.

A line of electric railway connecting Williamsville, N. Y., with Buffalo has been begun.

The new company contemplating the construction of an electric railroad to Milan and Huron, O., will commence work shortly.

The Alaska Coal Company, of San Francisco, which has its coal beds on Cook's Inlet, will operate its mines exclusively by electricity.

There has been proposed a plan to unite by an electric railway the towns of New Philadelphia, Canal Dover, Dennison and Uhrichville, O.

Merrimac, Mass., is to have a power house with ample capacity to operate electric cars between Haverhill, Mass., the town above-named and Salisbury Beach.

The Interstate Railway, an electric street road extending from Providence, R. I., to Attleboro, Mass., and other Massachusetts towns, has filed a $1,000,000 mortgage. The road is in opposition to Old Colony local traffic.

Ten electric storage battery cars for use on the Second avenue line, New York city, are being constructed by the Waddell-Entz Company at its Bridgeport works. They will be finished in time to be put in use this winter.

The Buffalo board of aldermen has memorialized the State board of railway commissioners, asking that permission be granted for running the Buffalo trolley cars at a higher rate of speed than the low one now prescribed.

Ex-Gov. Cheney and others, of Manchester, N. H., have sold to Gen. Charles Williams 95 shares of stock of the street railway company of that city for $200 a share. Gen. Williams now owns nearly every share in the stock of the company.

The board of trustees, of Sacramento, Cal., have passed a franchise granting the Folsom Water Power Company the right to bring into Sacramento city by wire, electric energy from the Folsom dam for lighting and motive power purposes. This is in addition to the electric railway franchise already granted to the same company.

Flatlands, Long Island, has come into the market for the first time as a location for country residences, doubtless as the result of the building of the electric road, which is an extension of the Flatbush avenue line of the Brooklyn City Railroad, and gives a continuous ride for the one fare. The property has just been sold to a syndicate for $111,000 and this is the first time it has changed hands for 300 years.

That the trolley has come to Brooklyn was fully demonstrated on November 7, when the City Railroad Company opened its Third avenue trolley line and the horse cars disappeared. On turning into Fulton street from Flatbush avenue the cars are operated by wires suspended from the Kings County Elevated Railroad structure along Fulton street to the ferry. They are the most nobby cars ever seen in Brooklyn, being olive-hued and two feet wider and four feet longer than the ordinary horse cars. There was 50 of them in operation and no mishap occurred. Court street will be the next line from which the horse cars will be removed.

During the recent Canal Convention, at Buffalo, N. Y., a letter was received from Governor Roswell P. Flower, in which he said:

"What seems to be most urgently needed is faster navigation. It is a curious thing that, in spite of the wonderful advances in means and rapidity of transit during the last half century, canal boats are still propelled by the old-fashioned power. If steam cannot be successfully utilized without injury to the canals, I suggest whether electricity does not offer some encouragement, applied possibly after the fashion of the trolley system. Between Niagara Falls and the Hudson River there are ample water powers for generating the electricity and that would obviate one great difficulty. There may be others, quite insuperable, which will occur to practical minds, but certainly the advantage of swifter canal navigation warrants careful investigation and experiments in this direction."

# ELECTRICAL REVIEW

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Bring on your electric lamps! These are encouraging times for original inventors.

The Rapid Transit Commission will this week publish the plans of the new rapid transit railway which it is expected will be built in this city. The plans at present call for a four track electric road, part of which will be underground.

It is a wonderful thing the way in which electrical literature is increasing. Not so many years ago an electrical library of ten volumes embraced all the available literature on the subject. There are now current about 400 titles of electrical books.

When the man of these times wants anything done quickly he calls upon electricity to help him. This was evidenced in the collection of the recent election returns. The telephone, the telegraph and the electric search-light were all called upon, and all responded nobly to the service required of them. The long distance telephone again demonstrated its superior fitness as an instantaneous and efficient instrument for news service. Returns secured in this way were reliable and eagerly sought for.

The daily newspaper men of to-day, do not, apparently, realize the possibilities of the long distance telephone. Every important event could be telephoned by the observing reporter direct to the composing room and be put in type, sentence by sentence, as delivered into the transmitter at the scene. A foot ball, base ball or boxing match or horse race could thus be fully reported, the quick-eyed scribe telling into his telephone, which he could carry about with him attached to a coil of wire, every incident as it occurred, and the newspaper at the other end could put the matter in type as fast as received. If our afternoon papers would only see it, their reports could be much more complete than as at present.

We are pleased to learn that a large number of protests from intending exhibitors at the World's Fair have been received by the National Commission against closing the Fair at 7 o'clock in the evening, except on fête occasions. It has been understood from the first that the Fair would be open to visitors at least until 10 o'clock every night. Naturally, an electrical exhibition, including electric lighting features of great magnitude and importance, is of no value unless it can be displayed at night. The National Commission should at once modify the rules so as to enable the electrical display to be shown to the proper advantage, or they will find that what promised to be the most important part of the World's Fair will dwindle down to a mere side-show. Several large electrical companies have already threatened to curtail their exhibits unless the rules are modified.

### *LOOK OUT FOR SNOW.*

When many of our electric railway managers were boys it was just about this time of year that they got down from the attic, or up from the cellar, or out from the woodshed, their old "double runners" and polished and oiled them up, in anticipation of many coasts down the icy hillside roads. They are doing pretty much the same thing now, except that the "double runners" have developed into electric railway snow plows, whose function is to spoil coasting rather than to facilitate it. These machines are of very recent origin and are still, in many ways, experimental devices.

Plows and sweepers have both been used to displace the snow from electric railway tracks. It has been thought by some companies that the sweeper does its work too thoroughly, as it cleans off all the snow, leaving only the bare ground for the use of other vehicles on runners. This causes delays to the electric cars and interferes with their prompt operation. Crosby and Bell state in their book on the electric railway that "it is best to leave an inch or two of snow on the track, as when cleared by plows. Unless the snow is very much compacted, or has become a sort of frozen slush, it is then possible to obtain fair contact between wheel and rail, thus keeping up the car service." The proper function of the snow plow is its constant use in keeping the snow on the tracks from packing and freezing. Its principal use is in city streets. Where the road runs out into the country, or where the snows are light, the sweeper service will probably prove equally desirable. On many roads a combined plow and sweeper service will be found best of all.

These machines are built as simple plows, resembling the old plows used on horse roads, as sweepers and as a combination of both plow and sweeper, the latter, however, being a rather expensive device.

In localities where heavy and severe snow storms prevail it is wisdom for the electric railway manager to keep a part of his plant in constant working order, day and night, and the "snow gang" within easy reach, so that on a few minutes' notice the attack may be begun. The secret of the successful operation of electric railways during the winter season lies in the snow plow or sweeper always keeping ahead of the snow.

### *ELECTRICITY AND THE FARMER.*

The November number of the *Engineering Magazine* contains an interesting article by William Nelson Black, discussing the influences the electric motor is likely to exert in rendering farm life more agreeable. Mr. Black's views coincide perfectly with those defined in the ELECTRICAL REVIEW for November 7, 1891, under the caption of "Electricity as a Reformer." We believe he correctly attributes the dissatisfaction with farm life and farming pursuits, and the large influx of population from country districts to the cities, to the comparative hardships and discomforts of country life instead of to the alleged gregarious tendency of the human family. When life in the country is attended with comfort and convenience it will be preferred by a large proportion of the public to city life. Mr. Black thinks the electric motor will insure such a condition by enabling the farmer to readily market his produce; that it is not unreasonable to expect the electric railway to cover every township with a net work which will permit free intercourse of all the residents, and that the opportunities thus opened for rapid transit of country folks to and from the town, and easy communication *inter sese*, will make country life not only tolerable, but preferable to city life. The article only faintly touches a side of the subject which will be a more potent factor in the creation of this new social status. When electric railways cover the townships from end to end, every farm and every dwelling-house may be supplied with power—a result which will transform the drudgery, which is now its chief incident, into easy work; the plows and harrows, the reapers and mowers will be pushed over their difficult paths by an easily controlled electric motor; the churns and other domestic paraphernalia will spin merrily under the same influence, and the drowsy petroleum lamp which makes hideous a night in the country will give way to the incandescent lamp, and the evenings will become periods of brightness and pleasure.

The electric motor will do still more: it will furnish cheap power to the individual consumer and, by permitting manufacturing to be conveniently performed in small plants, will diversify industry. It will prove a counter-irritant against trusts, and permit a clever mechanic to produce at home what now must be made in expensive plants, requiring a heavy capital for their maintenance. There will thus be opened wide the doors of competition and the general public as well as the individual will prove the beneficiary. We may reasonably expect that the next decade will find the results herein referred to accomplished facts, at least to a considerable degree. A reaction in favor of the country districts is needed; the atmosphere of city life is unsuitable for the development of rugged manhood. The nation will gain vigor by a more uniform distribution of its citizens. During the last decade the flow of migration has been strongly toward the city; electricity will produce a change of tide.

The death of the Duke of Marlborough, at Blenheim Palace, on November 9, removes an interesting figure from the world. Passing over his private and political life, we find that had he lived the Duke might have proved to be an important factor in the British electrical world. He was president of the amalgamation formed by the National and the New Telephone Companies, and had recently visited Sweden, where he thoroughly inspected the excellent telephone system which there prevails. The Duke proved to be an eager and interested student of telephony, and just before his death had arranged to send his company's chief engineer, Mr. A. R. Bennett, on a lengthened visit to Stockholm, for the purpose of acquiring an experience which would prove valuable in bettering the London telephone service. It is to be hoped that these plans of the Duke of Marlborough will be carried out to a satisfactory completion in the hands of his successor.

# CORRESPONDENCE.

## OUR CANADIAN LETTER.

**Brockville, Ont.**—In order to meet the demand for electric light, additional machinery will have to be purchased and the whole plant enlarged at a cost of several thousand dollars.

**Montreal, Que.**—A deputation of the council of Cote St. Antoine waited upon Mr. Everett, the managing director of the Montreal Street Railway Company, who promised them that cars would be running through the Cote in the course of next week. Another generator has been shipped from Peterboro, Ont., and 10 more electric cars will be running within a week or so.

**Quebec, Que.**—The Quebec and Levis Electric Company, which recently purchased the famous Montmorency Falls and mills from the Hall estate for a quarter of a million dollars, intends to apply to the Legislature next session for power to change the corporate name, so as to purchase and lease lands, rivers, lakes and water powers, and to build, manufacture, lease and sell dams, flumes, canals, power, mills and all kinds of electrical apparatus and appliances.

Montreal, Nov. 12. J. A. C.

## OUR CHICAGO LETTER.

A. H. **Englund,** manager of the International Register Company, reports having just completed an order for 150 portable registers for the West Chicago Street Railway Company.

Mr. **Taylor,** of the Taylor, Goodhue & Ames Company, reports business prospects very bright. Although in the field but a very short time, they have been doing a good business which will increase rapidly, as the firm has many friends who will give them as much of their business as possible.

Mr. **Richardson,** of the Enterprise Electric Company, left this week for Bristol, R. I., where the factory of the National Rubber Company is located. The Enterprise Electric Company are general western agents for the insulated wires and cables made by this company, and report a big demand for this wire, which is giving the very best satisfaction.

W. **R. Mason,** general manager of the Railway Equipment Company, reports a very large business in the electric heating line. This company has secured the sole right to manufacture the Ahern heater in the United States, and are running their factory to its full capacity and yet are unable to fill orders. The electric stove which they are producing is of a very artistic design and finds ready sale. M. J. B.

Chicago, Nov. 12.

## OUR BOSTON LETTER.

The **Mechanics' Fair,** this city, has proven to be a success in the various departments. The electrical exhibits have attracted especial attention.

Mr. **Thomas H. Brady,** of New Britain, Conn., the popular manufacturer of mast-arms, has recovered his health after a long and painful sickness.

Messrs. **Gerrold & Roberts,** Mason building, this city, have formed a partnership to carry on a wiring and construction business. They will make a specialty of fitting up hotels and residences with electric bells and speaking tubes.

**New England Therapeutic and Fire Alarm Company,** of this city, has removed its offices from No. 194 Washington street to the palatial marble building No. 95 Milk street. Manager J. H. Roberts explains to visitors the merits of the new system.

The **A. B. Pitkin Machinery Company,** of Providence, R. I., have opened branch offices and salesrooms corner of Oliver and Purchase streets, this city. A complete line of this company's well-known machines, shafting and pulleys will be found at the Boston house.

Messrs. **Chas. Jacobs & Company,** this city, manufacturers of the Jacobs feed water heaters, are doing a large and satisfactory business among the manufacturing marts and electric lighting stations. Among the large orders filled for feed water heaters thus far this month, eight aggregated 2,400 horse-power.

Mr. **Geo. A. Beatey,** electrical engineer and contractor, this city, has removed his offices from 209 Washington street to 620 Atlantic avenue. He has a contract with the Milton, Mass., Light and Power Company to enlarge its station to one-third more than its present capacity. Mr. Beatey reports a contract in hand for furnishing the entire lighting and power equipment for an electric light plant at Lakeland, Fla. The same gentleman will soon take out two patents which will greatly interest and benefit the public. W. I. B.

Boston, Nov. 12.

## LITERARY.

"Reports from the Consuls of the United States" for July and August, 1892, have been received.

We have received from the legislative assembly, of Ontario, the "First Report of the Bureau of Mines" for 1891, giving very complete information of the Canadian mining interests.

The *New Kansas Magazine*, conducted by W. H. Wynn, Ph. D., D.D., at Atchison, Kan., is doing good work in presenting the material, intellectual and moral growth of the State of Kansas.

For the first time in its history, *Scribner's Magazine* has a colored frontispiece, reproducing, in a marvelous manner, a water-color painting made for the Christmas number by L. Marchetti, a skillful French artist.

So clever a society woman as Mrs. Burton Harrison, and so excellent an authority, does well when she employs her pen to define social laws and point out mistakes for girls to avoid, and thousands of girls can and should read the first of her series of articles on "The Well Bred Girl in Society" in the November *Ladies' Home Journal*.

Secretary George F. Porter has just distributed the report of the thirteenth convention of the National Electric Light Association, held at Providence, February 17, 18 and 19, 1891. The report is embodied in a handsomely printed and bound volume of about 350 pages from the press of the James Kempster Printing Company, New York. A list of the conventions held by the Association, the names of all the presidents, and a full list of members form an important feature of the report, which shows throughout the evidences of careful editing and arrangement. A few business announcements of prominent electrical firms find a place in the back part of the book. Among these are the American Electrical Works, Falls Rivet and Machine Company, Okonite Company, Washburn & Moen Manufacturing Company, Detroit Electrical Works, Phœnix Glass Company, Faraday Carbon Company, Brush Electric Company, Mather Electric Company, General Electric Company, Beacon Vacuum Pump and Electrical Company, Germania Electric Company, Fort Wayne Electric Company, Packard Electric Company, New York and Ohio Company, Alfred F. Moore, Eddy Electric Manufacturing Company and Day's Kerite.

## PERSONAL.

Walter K. Freeman, recently of Boston, and who has been connected with various electrical enterprises, has gone into insolvency.

Mr. John Carroll, treasurer of the Eugene F. Phillips' Electrical Works, of Montreal, and Miss Emily Silina Ryan were married at Newport, R. I., on November 7. The ELECTRICAL REVIEW extends its heartiest congratulations to the young couple. We know of no other young man in the electrical fraternity better deserving a good wife than Mr. Carroll.

Mr. Eugene Rowland Phillips, son of Mr. Eugene Phillips, was married October 18 to Miss Carolyn Isabelle Williams, of Boston. The young couple will reside in Providence, where a cosy home has just been completed and presented to the groom by his father. As this is the third or fourth marriage occurring in Mr. Phillips' establishment, and as two other similar events are soon expected to occur there, leaving only the office boy, it would seem that the American Electrical Works is a good institution to be connected with—if you want to get married.

The project of the New York Press Club to build a home in this city is meeting with popular favor. It is necessary, to secure a site, that $100,000 be raised by January 1. About half this sum has already been pledged. Committees representing the leading industries of the city have been appointed. Mr. George M. Phelps is chairman of the electrical committee, and with other members will call on the electrical interests for subscriptions during the next few days, and we hope will meet with a liberal response.

## A Government Telegraph Line.

The United States Government will make an exhibition at the World's Fair in Chicago, to illustrate the growth of telegraphy in this country, says a Washington dispatch to the New York *Evening Post*. This is supposed to be in pursuance of Postmaster-General Wanamaker's hobby of a postal telegraph. Mr. Wanamaker would like to see the government own the whole telegraph system in the United States. It did once; and the strange part of the business is that, if circumstantial evidence goes for anything, it still owns to-day as much as it did then. Thereby hangs a tale.

When Prof. S. F. B. Morse was a struggling inventor—simply a "man with a crotchet"—he induced Congress to give him a chance to show what he could do by constructing an experimental telegraph line between Annapolis Junction, Md., and Washington. The wire and instruments were in position on the 1st of May, 1884, when the Whig National Convention at Baltimore was about closing its labors. Professor Morse had a receiving table rigged up at the Capitol, where he took his station, surrounded by a group of Congressmen, journalists and curiosity-seekers, while one of his assistants, Alfred Vail, placed himself at the other end of the line and established connection by signals. Presently a message came ticking over the wire from Mr. Vail at Annapolis Junction, the contents of which Professor Morse announced to the assembled company:

"The train from Baltimore for Washington has just reached Annapolis Junction. It brings the news that the Convention has adjourned. The ticket nominated is Clay and Frelinghuysen."

Clay's name did not surprise any one, but "Who's Frelinghuysen?" sounded on every side, and gave the first impulse to a campaign fling which lasted six months.

The experimental line was worked in a spasmodic way for a couple of years, while the government was given every opportunity to buy out the entire rights of Prof. Morse and his associates and become owner of a monopoly of electric communication in the United States. But few of our statesmen of those days could be brought to believe that the invention would ever prove so immensely profitable. At the end of the experimental period the government made up its mind it did not want to play with the expensive toy any more; nobody at the moment stood ready to buy outright the line from Annapolis Junction to Washington, so an arrangement was made whereby Vail and another assistant of Prof. Morse's, named Henry J. Rodgers, were to hire it by the year and make what they could out of it.

That year has not yet ended. At least there is no evidence, on the one hand, that the lease was ever renewed, or, on the other, that the government took possession again of its property. So far as any one has been able to find out, the lapse of time was unnoticed by the people whose business it was to watch over the government's interests; the other side had no object to gain in remembering it, and, as a consequence, the line was afterward passed from hand to hand without government interference, until all traces of its original ownership were covered up by the dust of time.

The government has just made this discovery in ransacking the old books and papers of 40 odd years ago, with a view to making up an historial sketch as a basis for its exhibit. It will probably be able to show at Chicago the first message ever ticked over a long wire, and it is now endeavoring to procure the two instruments and a part of the original wire used. It is meeting with some difficulty; but authorities who have looked carefully into the government claim say that if the apparatus can be positively located and identified, a suit for replevin will lie. It is possible that Mr. Wanamaker will resort to that extreme if he ascertains with reasonable certainty that what he wants is now in the custody of his arch enemy, the Western Union, as it is said to be.

The Postal Telegraph Company are opening an office in Sayre, N. Y.

## CONSIDERED OF GREAT VALUE.

THE MANAGER OF THE WESTERN ELECTRIC COMPANY CONGRATULATES THE "REVIEW," AND CONSIDERS ITS "ADVANCE INFORMATION" DEPARTMENT OF GREAT VALUE.

TO THE EDITOR OF ELECTRICAL REVIEW:

I wish to congratulate you on the many improvements in the REVIEW, noticeable among these being the "Advance Information Department," which I consider of more value than anything of like character I have seen elsewhere.

Yours truly,

(Signed) C. D. CRANDALL,

Chicago, Ill., Oct. 6. *Manager.*

## GENERAL NOTES.

The telephone wires in Wilkesbarre, Pa., are being replaced by others in small cables.

The telephone service at Roanoke, Va., is to be perfected at an outlay of over $7,000.

The Natick, Mass., Electric Railway Company has declared a dividend of 3 per cent. to all stockholders on the books of the company, October 15.

Work is progressing rapidly on the telephone service in Jacksonville, Fla., and the exchange is expected to be ready for business some time next month.

The Steinway system of electric railways at Steinway, L. I., is to be considerably extended, and to that end 20 additional car equipments have been ordered from the Eickemyer-Field Manufacturing Company, of Yonkers, N. Y.

A telephone system is to be introduced into Aroostook county, Me. The plan is to connect Houlton, Presque Isle, Caribou and Fort Fairfield on the trunk line, and then to give other towns and villages which come to any of the above as a natural business center radial branches.

Surveys are now being made for the electric railroad which is soon to connect Buffalo and Niagara Falls. It may be built back of the present railroads on a proposed new road or boulevard, if the land owners will open up such a road and give the right of way. It is most likely, however, to go over the River road.

The electrical features of the "electrical wedding" mentioned on page 138 of the ELECTRICAL REVIEW for November 12, 1892, were installed and operated by the construction department of the Ries Electrical Specialty Company, of Baltimore, Md. The work was very creditable, and of an extremely unique character.

The Lobdell Car Wheel Company, of Wilmington, Del., have placed the contract for their new machine shop with the Berlin Iron Bridge Company, of East Berlin, Conn. The building will be 67 feet in width, divided into a central portion 25 feet in width, with a wing on each side 21 feet in width. The central portion is controlled by a 15 ton traveling crane. The building will be 151 feet long, the entire framework being of iron, the side walls being of brick.

The Bell Telephone Company of Buffalo is very busy just now in actively arranging for sub-central stations to relieve the enormous pressure of work on the central exchange. It has secured two locations, one at 298 Bryant street and one at the same number on Carolina street, near the junction of West avenue, and the work of connecting these with the central office is being vigorously pushed. To the sub-station at 298 Carolina there are now 40 conduits laid, of which seven run down Carolina street, the others branching in various directions to best accommodate the district to be served. The Bryant sub central is located near Elmwood and just west of the First Congregational church, and will serve a very large and rapidly growing district.

### Electricity at Rome.

M. Henri de Parville, in a recent issue of the Paris *Correspondant*, gives the following particulars of the use of electricity at Rome: The Eternal City has had for three or four years important works for electric lighting by alternating currents and transformers, operating at 2,000 volts with steam engines. It was indeed at Rome that one of the first applications of alternating currents on a large scale for the production of electric light was made. For a long time a preference was given to continuous currents. To traverse long distances, however, it is preferable to use alternating currents, which can easily be produced with pressures of from 4,000 to 5,000 volts. There do not exist works with continuous currents exceeding 3,000 volts.

The works at Rome, though often enlarged, had become insufficient to answer the constantly increasing demands for the electric current. It occurred to the authorities to utilize the Falls of Tivoli, about 18 miles from Rome, and this has been done. The works have just been completed and are very remarkable.

The mechanical energy of the Falls of Tivoli has been brought to the gates of Rome with a potential of 5,000 volts. There takes place a first transformation. The always dangerous current of 5,000 volts is brought down to a potential of 2,000 volts. From this point the wires are laid underground through the city, and by a second transformation, the current is reduced to 100 volts. The apparatus called "transformers," which bring about this reduction of pressure, leave now a pressure of from 96 to 100 volts at most. Very little then, is lost on the way. Some years ago this transformation could not have been made economically.

The hydraulic station at Tivoli is situated in the villa which was the residence of Mæcenas, the minister of the Emperor Augustus. The station is fed by a fall of water about 366 feet high. The delivery reaches about 875 gallons a second. This real river is brought over an ancient Roman viaduct, in a canal 500 feet long and 10 feet wide, to a station where the hydraulic machinery is established, on the side of the mountain, in a very picturesque situation. The water entering a room about 83 feet long and 50 wide, passes through a large pipe subdivided into three branches. The water from each branch feeds a group of three turbine wheels—two turbines of 350 horse-power, one of 50 horse-power—of the Girard pattern. These nine turbines engender a total of 1,200 horse-power. Each dynamo produces a current of 5,100 volts and 42 amperes.

From the hydraulic station the current is sent to Rome by cable. The line traverses the Roman Campagna in nearly a straight direction, and is composed of four cables of copper wire. Each of these cables is formed of a strand of 19 wires 2.6 millimetres in diameter, which gives a total section of 100 square millimetres. The four cables weigh altogether 100 tons. The Roman Campagna is generally deserted; still precautions have been taken against danger. The cables are supported by insulators on poles. Near the Porta Pia is the building where the current is transformed. Thirty-two transformers reduce the potential of the line to 2,000 volts. Finally the current thus modified is carried to the places where it is used for power, and there the current is brought down to a pressure of 100 volts. All the apparatus, from Tivoli on, works with perfect regularity.

The progress realized can be estimated by recalling that, in 1873, for the first time, Mr. Fontaine transmitted, at the Vienna Exposition on the Prater, before the Emperor, a current of one-horse power a distance of about 160 feet. Now from Tivoli to Rome a current of 1,200 horse-power is transmitted 18 miles.

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Mr. A. S. Corriveau will build an electric railway in the municipality of Sault au Pecollet, Canada.

### Infection by Telephone.

The possibility of infection by the use of the telephone mouthpiece by successive speakers has been hypothetically discussed before now. A correspondent of the *British Medical Journal* brings foward some facts in support of the possibility of such an occurrence. Dr. Anderson, the Medical Officer of Health for Dundee, who has had the matter submitted to him, has given a very sensible answer, which sums up the position in a practical manner: "If a person who is suffering from a sore throat of an infectious nature brings his mouth into close, or even near relation to the mouthpiece of a telephone instrument, I think, in the act of speaking and expiration of air from the lungs and throat, it is possible that infectious particles might adhere to the instrument. I think an instrument which is so much exposed to the human breath should be frequently cleansed, whether the instrument be in a public or private room, and perhaps the simplest and most convenient cleanser is warm water and carbolic or other disinfectant soap."—*Medical Record.*

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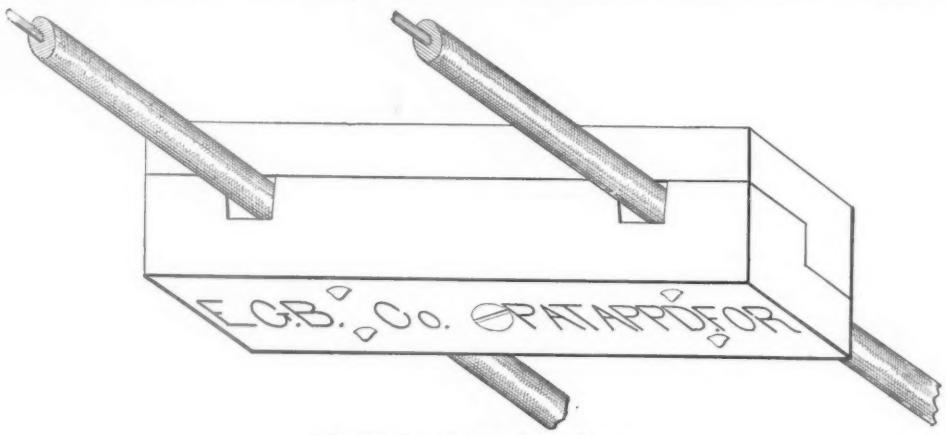
### A Safety Adjustable China Cleat.

As a number of insurance experts have recently decided against the use of wooden cleats for supporting interior wiring, the E. G. Bernard Company, of Troy, N. Y., have designed the safety adjustable china cleat, illustrated herewith, to meet the new insurance requirements when they shall be made public. It is very strong, easy to install, and has been in use for some time.




A Safety Adjustable China Cleat.

Both parts, top and bottom, are exactly alike, therefore avoiding any trouble or mistake in packing or breakage, and saving time in putting up. The cross section is so designed as to strengthen the cleat, and only requires one screw and four small teats, or lugs, to hold it secure in its position when once it is put up, so that perfect alignment is secured. It is adjustable and is made both glazed and unglazed from superior imported clay, and is thoroughly vitrified and strong. Orders for over 100,000 have already been placed. The Western Electric Company, The E. S. Greeley & Company, and Alexander, Barney & Chapin, of New York, carry a stock on hand to supply the trade.

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### Electric Light and Gas.

The erection of numerous large electric central stations has naturally brought the respective merits of gas and electricity for lighting purposes to the fore, as well as the question of what effect the increased adoption of the latter is likely to have upon the consumption of the former, says London *Engineering*. As a rule, however, the consumption of gas is steadily increasing, notwithstanding the more general adoption of electric light. In Stockholm, for instance, the increase in the consumption of gas in the year 1888, when 14,000 incandescent, and about 250 arc lamps were in use, amounted to more than 6½ per cent., a state of affairs which still exists, although electric light has in the mean time become much more general. In Berlin, where the central stations alone feed some 100,000 lamps, in addition to numerous private installations, the increase in the consumption of gas has of late years been steady. During the financial year 1888-9, for instance, the private consumption of gas rose 7½ per cent., although the number of electric lamps was doubled during the same period, a fact which becomes still more remarkable when it is pointed out that the increase in the gas consumption was largest (about 10 per cent.) in the central part of the town, which was nearest to the electric installations. Under these circumstances the corporation of Berlin decided to build a fifth gas works, calculated for a maximum production of not less than 12,400,000 cubic feet per day. At about the same time, Hamburg expended £150,000 in the extension of one of its gas works, although at the same time an electric central station for 20,000 lamps was being built. In Leipsic the old gas works have been extended and the new ones doubled, simultaneously with the erection of several important electric installations. At Elberfeld, a manufacturing town of a little more than 100,000 inhabitants, the consumption of gas is increasing, although there is a central electric station of 7,000 lamps capacity. The same is the case at Mühlhausen. At Darmstadt, with only 50,000 inhabitants, the gas works were taxed to the utmost of their capacity; an electric central station for 4,000 lamps was, therefore, built, but the gas works have since had to be extended. At Lubeck there was, to begin with, a decline in the consumption of gas after the central electric station of 2,600 lamps had begun operations, but this did not continue for more than a year, and since then the consumption of gas has been steadily increasing. In Gothenburg, electric light has been adopted to an unusual extent, and is constantly increasing, but still the consumption of gas becomes larger every year, and a new gas works has been built. Of course, it is improbable that a continued increase of electric lighting will also, for the future, be attended by a larger consumption of gas, yet there is no reason to anticipate any marked decadence as far as gas is concerned; for along with its original use for lighting purposes, gas is every day applied more and more to heating and industrial purposes.

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### New York Electrical Society.

The one hundred and forty-seventh meeting of the New York Electrical Society was held at Columbia College on Thursday evening, November 10. President Joseph Wetzler called the meeting to order shortly after 8 o'clock, and, as soon as the routine business had been disposed of and 16 applicants for membership had been elected, Mr. R. S. Dobbie was introduced as the lecturer of the evening.

The subject chosen was "The Electric Arc," which Mr. Dobbie proceeded to handle in a masterly manner, beginning with the first experiments of Sir Humphrey Davy as far back as 1810, and describing and illustrating the development of the arc from that time to the present, including the many styles of lamp and methods of operation. The lecture was interspersed with illustrations and experiments, showing the arc projected on a screen in all the stages of development and under various conditions, and the nature of the phenomena involved. The lecture was deeply interesting, as well as instructive throughout, and at its conclusion Mr. Dobbie was tendered the thanks of the Society.

### West End Street Railway Company's Annual Report.

The annual report of the West End Street Railway Company, of Boston, as of Sept. 30, 1892, is thus summarized by the Boston *News Bureau*:

There was a net income after dividends of $6,385, which was carried to surplus account. There was paid in dividends: Eight per cent. on the preferred, $512,000; five per cent. on the common Jan. 1, $357,112.50; five per cent. on the common July 1, $452,250; a total in dividends of $1,323,362. The fixed charges paid were $609,701.

At the close of the year about two-thirds of the mileage, or 1,000,000 car miles per month, was in the electric system. It is expected that 200 electric cars will be added Jan. 1, when the power house will be practically completed. With some additions already planned for at the Cambridge station the new power will be sufficient for many years to come.

By Jan. 1 all the tracks in the city proper will have been rebuilt. The year 1893 should see the substantial closing of all construction and re-construction work. Thereafter expenses connected with existing lines "should be borne by surplus as a credit to depreciation account."

The surplus account has been increased from $214,661 to $336,285 by a credit of $786,934.15, "premiums received from sale of stock by auction," and the surplus for the year, less depreciations written off, and $429,281 charged out "to excess cost of 36.95 miles of track rebuilt with girder rail during the year above the amount allowed to be capitalized."

The balance sheet for Sept. 30, 1892, shows notes payable $1,376,448, unpaid vouchers and accounts $922,120, and total liabilities outside of capital stock and funded debt $2,516,955. The cash assets and accounts are $1,607,971, of which $355,052 is cash and $554,029 materials and supplies.

We compare the reports for three years as follows:

| | 1892. | 1891. | 1890. |
|---|---|---|---|
| Gross | $6,317,205 | $5,968,984 | $5,780,083 |
| Expenses | 4,477,783 | 4,445,559 | 4,234,401 |
| Net | 1,839,422 | 1,523,424 | 1,546,042 |
| Charges | 509,702 | 545,116 | 478,831 |
| Balance | 1,329,720 | 978,308 | 1,067,211 |
| Track rebuilt | ..... | ..... | 282,198 |
| Sur. for dividends | 1,320,720 | 978,308 | 785,012 |
| Dividends | 1,323,363 | 868,317 | 737,000 |
| Surplus | 6,358 | 89,991 | 48,012 |

Of the gross earnings of 1891-92, $3,363,310 were from electric and $2,907,096 from horse, the balance from rents and miscellaneous. Of the net earnings, $1,343,683 were from electrics and $495,739 from horse.

Earnings and expenses per mile run for revenue:

| | Total. Cents. | Electric. Cents. | Horse. Cents. |
|---|---|---|---|
| Earnings per revenue mile run | 36.10 | 39.52 | 32.86 |
| General expenses | 02.09 | 02.09 | 02.09 |
| Maintenance track and buildings | 01.67 | 02.07 | 01.28 |
| Maintenance cars, vehicles and machinery | 01.25 | 01.42 | 01.09 |
| Motive power | 09.52 | 06.93 | 11.98 |
| Transportation | 11.05 | 11.22 | 10.90 |
| Total expenses | 25.56 | 28.73 | 27.34 |
| Net | 10.52 | 10.79 | 5.52 |

Relative percentage ratio of operations as between horses and electrics:

| | Total. | Electric. | Horse. |
|---|---|---|---|
| Relative ratio of mileage | 100.00 | 48.63 | 51.37 |
| Relative ratio of gross earnings | 100.00 | 53.24 | 46.76 |
| Relative ratio of net earnings | 100.00 | 73.04 | 26.96 |
| Operating expenses, per cent. earnings | 70.88 | 60.04 | 83.22 |

President Whitney figures that the road should earn next year $2,600,000 net; charges, taxes and dividends, including 10 per cent. on all common stock, $2,100,000; surplus, $500,000. The finance committee of Messrs. T. Jefferson Coolidge, Nathaniel Thayer and Isaac T. Burr has been abolished.

### The Strowger Automatic Telephone Exchange at La Porte, Ind.

Upon invitation of the Strowger Automatic Telephone Exchange, several Chicago capitalists and members of the electrical fraternity and press, left on a special train over the Michigan Central, Thursday, November 3, at 10.30 o'clock, to witness the first practical demonstration of the utility of the Strowger automatic telephone exchange just installed at La Porte, Ind. The special train reached La Porte at one o'clock, where the visitors were met by Maj. C. I. Wickersham, manager of the exchange, also by the La Porte Cornet Band, which escorted the visitors to the Central Telephone Exchange, 705 Main street. Here they were introduced to Mayor Scott, who extended the freedom of the city, and who said he had given the Strowger automatic telephone a personal trial, and was glad to announce that its performances were better than the promises made by the company, after which Mr. Strowger, the inventor of the system, was introduced and for ten minutes spoke of the pleasure it afforded him to witness such a consummation of the many weary hours he had spent in perfecting his invention. After having finished his short address, the visitors were allowed the opportunity of trying the system, and it was pronounced a great success, after which they took the train for Chicago, reaching the city at six o'clock in the evening. Lunch and refreshments were served *en route*.

The Strowger Automatic Telephone Exchange Company, of Chicago, was incorporated November 18, 1891, under the laws of the State of Illinois, with a capital of $5,000,000. M. A. Meyer, president, A. B. Strowger, vice-president, and J. Harris, secretary, are the officers of the company. Besides owning its own patents and improvements, this company is also the sole owner of 65 other valuable patents on telephones, switches, fire alarm and telegraph signals, including the foundation or basic patents on automatic switches, No. 222,458, all of which were the property of the North American, United States and Mercantile Telephone Companies, of New York.

Letters patent have already been issued to this company for its patents and improvements in United States, Canada, England and Belgium, and it is awaiting the return of patents from many foreign countries where applications have been made.

This system is already adopted in the Dominion of Canada, and under acceptance of the proper officials the system has been adopted at Fort Sheridan, Ill., where an exchange is now being built and will be in operation within a few weeks. Many propositions are now under consideration for the sale of the European rights and for the granting of licenses to companies in many States in this country.

This, as its name designates, is a telephone exchange or switch capable of being automatically manipulated from a distant station by means of electricity. Its object is to give each subscriber perfect control of his connecting device at the central office, thereby dispensing with the service of attendants; that is, the subscribers do all there is to be done in calling up any other telephone.

The mechanisms by which this is accomplished are illustrated by Figs. 1 and 2. Fig. 1 represents all there is at the subscriber's office, consisting of three or more keys, as required, marked from left to right, as, release, units, tens, hundreds, etc. Fig. 2 represents one of the switching machines at the central office, consisting of a switch disk of a hundred or more terminal contact points, with its accompanying machinery. The keys at the subscriber's office may be of any desired pattern, from that of a telegraph key to a push-button, and may be used with an open or a closed circuit battery.

The machine at the central office consists of a brass frame surmounted by a hard rubber disk. Within the frame is the mechanism by means of which the various connections are made, consisting of electro-magnets, levers, pawls and a shaft with ratchet wheels and a connecting arm. The armature of the units magnet is fastened to the units lever. To this lever is attached a pawl, which pawl engages the ratchet teeth of the units wheel. There are 100 ratchet teeth in the units wheel. The tens magnet, armature, lever, pawl and ratchet wheel are similar to those of the units; so also are the hundreds and thousands.

The disk is provided with rows of perforations, 100 in each row, corresponding with the ratchet teeth of the units wheel, and as many rows as there are hundreds of subscribers. Through these perforations wire terminals extend. Passing through the center of the disk, and at right angles thereto, is a vertical shaft, to which is attached a contact arm extending over the disk to the row of wire terminals. The shaft and arm are made to rotate by means of the magnets through the connecting agency of the levers and pawls.

On shelves at the central office are as many machines as there are telephones or subscribers. Each machine belongs, as it were, to its particular telephone, and is numbered by the same number, No. 1 machine belonging to No. 1 telephone, and to that only, nor can No. 1 machine be manipulated from any other telephone. The wires connecting the keys with their respective magnets are termed manipulating wires, to distinguish them from the phonic or talking wires. The

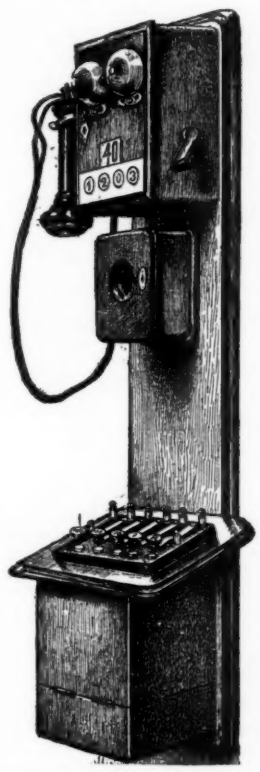

FIG. 1.—SUBSCRIBER'S TELEPHONE, STROWGER SYSTEM.

perforations in each disk are numbered with respect to the zero point or normal position. The wire terminals are likewise numbered.

In close proximity to the row of machines a cable or bank of phonic wires trend. The bank wires are also numbered to correspond with the number of the wire terminals and perforations. To each bank wire is attached its respective numbered terminal wires, that is, to No. 1 bank wire is attached No. 1 wire of each disk, there being, of course, as many bank wires as there are wire terminals. Like the network of the nervous system, all machines are methodically connected by a network of wires, each having its own peculiar functions to perform in order that there may be, as it were, no clashings.

The *modus operandi* in calling up is as follows: Suppose that telephone No. 25 wants telephone No. 123. No. 25 presses his hundreds key once, tens key twice, units key three times. No. 25's connecting arm is then on the twenty-third contact point of the second row of wire terminals, that is, on the one hundred and twenty-third contact point. By pressing the units key at the subscriber's office, the units magnet at the central is instantaneously actuated, thereby attracting its armature, causing its lever, pawl, ratchet wheel shaft and arm to be simultaneously moved. No. 25's arm being on contact point No. 123, No. 25's telephone is in electrical circuit with telephone No. 123. To signal subscriber No. 123, or call him to his phone, No. 25 rings his bell, which operation also rings No. 123's bell. Conversation may then be carried on in the usual manner, after which the ear phones are hung up, and No. 25 presses his release key, thereby actuating the release magnet, allowing the arm to return to normal position, by means of the weight seen at the left in Fig. 2.

In machines having over 100 contact points, the contact arm has also a centrifugal motion in order to reach any desired row, which movement is accomplished by means of magnets, lever, pawl and racks, similar to the units and tens. The centrifugal motion enables any desired row of hundreds to be reached, while with the rotary motion any desired contact point in the row is obtained. By using the thousands and tens keys, the contact arm jumps over ten rows or ten points in a row, as the case may be.

By a peculiar device, protected by patent, the contact arm has also a stepping motion, not a sliding one. As it moves along it is lifted up and planted down firmly on the contact wanted. With this system is a private wire device, by which perfect privacy of conversation may be maintained. Not even a person at the central office can hear what is said. At the same time, if either party is wanted, his bell may be rung, notifying him that he is wanted, which call he may answer or not, at pleasure.

The person calling up may know whether the circuit is completed by his bell ringing when he turns the crank of the magneto. If his bell does not ring, he may be reasonably sure that the bell of the person he wishes does not ring, though this does not necessarily follow. The fault may be in the magneto itself.

Simplicity being one of the many points of superiority of this mechanism, getting out of order is reduced to a minimum. As a brass clock will last for years without repairing, so will this machine last a lifetime.

Among the many points of superiority claimed in this system over the old, may be mentioned, first, a great saving in cost of a telephone system, particularly so in large towns; second, the expense of operators required in the ordinary exchanges, both day and night, is entirely avoided; third, the costly and troublesome switchboard is also unnecessary; fourth, a much more satisfactory service; fifth, instantaneous connection; sixth, no cutting off conversation by operators at the central office, seventh, disconnecting by the pressure of a single key, etc. Its adaptability to toll or trunk lines is said to be equal, if not superior, to any other system. There is said to be no question as to the limit of this machine—limit being reached only by the number of subscribers. Instruments of 10,000 connections can be as readily and easily manipulated, it is claimed, as one of 100.

### Electrical Insurance Risks.

Mr. Geo. P. Low, electrical inspector for the Pacific Insurance Union, has sent a letter asking for statistics from electric lighting and railway generating stations within the jurisdiction of the Pacific Insurance Union. These statistics will be used by Mr. Low in preparing a paper to be read before the next annual meeting of the Fire Underwriters' Association of the Pacific. The commendable object of Mr. Low's paper is to secure a better understanding by the fire underwriter of the central station as a fire risk.

Mr. Low's letter reads, in part, as follows:

"You must be aware that the belief is growing among fire underwriters that electric light stations as a class are very undesirable risks; and I think you will concur with me in the opinion that this belief is not as it should be. To refute it, and to prove such assertions as will be made by carefully gathered and reliable statistics, will be the aim of the paper, the success of which will entirely depend upon the individual efforts of each company in answering fully and honestly each question asked. Of course, all correspondence will be strictly confidential, and in no instance will the name of any company be mentioned, nor will a reference to any particular concern be made. Only aggregate results will be quoted."

There seems to be every reason why Mr. Low's request should be granted, and it is hoped that the missionary work he is undertaking will meet with the success it deserves.

### TELEGRAPH NEWS.

Captain F. T. Leigh, of the second brigade, N. G. S. N. Y., intends that his signal corps shall learn telegraphy.

It is said that arrangements have been made with the B. & O. for the purchase of its holding of 50,000 shares of Western Union stock.

The probabilities are that the Postal Telegraph Company will extend its lines from Denver, Colo., to Salt Lake City, Utah. The Postal Company may also acquire the lines of the Deseret Telegraph Company.

The directors of the Western Union Telegraph Company on November 10, decided to pay a 10 per cent. scrip dividend to stockholders of record December 3 out of the proposed new issue of stock. The balance of the issue will be turned into the treasury of the company.

A certificate of the increase of the capital stock of the Western Union Telegraph Company from $86,200,000 to $100,000,000 was filed in the office of the Secretary of State at Albany on November 2. The tax on such increase was $17,250. The certificate states "that the amount of the capital of said corporation actually paid in is $100,000,000, and that the whole amount of the debts and liabilities of the corporation is $15,254,560."

The Western Union Telegraph Company has issued the following statement: The attention of the company having been called to the fact that their apparent holdings of International Ocean Telegraph Company had been reduced 18,829 shares, and of Gold & Stock Telegraph Company 9,579 shares, as appeared by the summary of assets in the appendix to the annual report upon page 11, it was ascertained that by a clerical error these had been omitted from the list. They were deposited as security in the collateral trust and 5 per cent. bonds issued against them. The proceeds of these bonds were used to lay the two cables from New York to the Gulf of Canso and for other actual purchases made by the company. They were, however, included in the balance-sheet upon page 6, which is correct, including both the stocks named and the bonds issued against them.

### The First Electric Lightship.

A Washington press dispatch, of recent date, says that the first lightship whose lights are to operated by electricity will soon be in position. This was the ship which was built at the Bay City Iron Works, Michigan, and transported to the Atlantic.

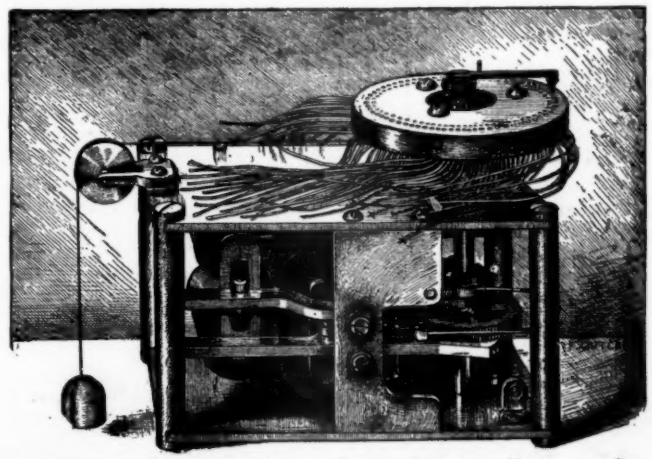

FIG. 2.—SWITCHING DEVICE AT CENTRAL OFFICE, STROWGER TELEPHONE SYSTEM.

The ship will be known as the Cornfield Point lightship, and will take her place about December 15 in Long Island Sound, about half a mile from the position of the present light vessel off Cornfield Point.

The new vessel will show simultaneously from four lens lanterns encircling the main-mast head a fixed white electric light during periods of 12 seconds, separated by eclipses of three seconds' duration.

Should the electric light machinery become entirely inoperative, oil lights will be placed in one set of lens lanterns, and the characteristic of the light will be fixed white. As a preventive of any such occurrence, the ship will have duplicate dynamos.

# MEDICAL ELECTRICITY.

EDITED BY DR. J. MOUNT BLEYER, NEW YORK.

## Transactions of the American Electro-Therapeutical Association.

AT THEIR SECOND ANNUAL MEETING, HELD IN NEW YORK, OCTOBER 4, 5 AND 6, 1892.

GENERAL DISCUSSION.

Dr. Massey said that he had found cataphoric anæsthesia of service chiefly in very superficial conditions, and, therefore, it had but a very limited usefulness in gynæcology. The objection to this method of treating enlarged glands in the neck with iodide of potassium is that a strong current cannot be used on account of the great irritation of the skin which it produces. Under this treatment, he had found that tumors would be considerably swollen for some days after the application. He had, therefore, employed his favorite soap electrode with a current of 60 milliamperes, and after persevering in this treatment for about one month, he found the glands had diminished. He had also found the method of electric elimination very useful in one case, when during the removal of hairs from the face by electricity he accidentally connected the iron needle which he was using with the positive pole, thus producing an iron stain in the skin. By reversing the current, the stain was quickly removed by the metal being redeposited on the needle.

Dr. W. F. Hutchinson said that with the exception of a very few observers, notably Drs. Petersen and Morton, most of us had accomplished very little with electro-cataphoresis, and he thought this was due chiefly to our confused knowledge of the physical laws governing its action.

Dr. F. von Raitz, of New York, said that many good observers differed widely in their statements on this subject; some claiming only anodal diffusion, others only cathodal diffusion, while still others believed that it occurs at both poles. In the paper which he read before the association a year ago he had called attention to the fact that certain substances have an affinity for one pole, and certain others for the other pole, and hence the varying degrees of diffusion from the poles.

Dr. Nunn said that he had made some experiments regarding mercurial de-medication, and had failed to confirm Vergnes's experiments and claims. In his own experiments in cataphoresis, he too had employed the solution on both poles, because he thought it might produce a better diffusion in the tissues, and he believed he had seen benefit from it. He did not favor the use of an iron needle for the removal of hairs, a gold one was much more delicate, and would last for many years.

Dr. Agramonte, of New York, by invitation, said that when Dr. Peterson had first presented his experiments on this subject before the Academy of Medicine, he had offered himself as a subject for experimentation, and he wished to give his personal testimony to the passage of the solution through the epidermis by the aid of the electric current, and the area of anæsthesia, about two inches in diameter, had been produced on his hand, so that the part could be pierced deeply with a needle without producing pain. The anæsthesia continued for several hours, and the only other effect noticed was a redness of the part, lasting for a day or two.

Dr. E. L. H. McGinnis, of New York, said that his experience with cataphoresis was limited to a few cases, and in these he had obtained no marked results.

Professor Houston, in closing the discussion, said that he could not agree with the President that osmosis can be neglected in the study of the physics of electro-osmosis. As there is a mutual, but unequal mixing of the fluids, there must be a transportation of material from the negative to the positive pole, as well as from the positive towards the negative, and, therefore, he saw no good reason for placing the same material on both electrodes. The fact that an electric current depending upon its direction, aids or retards the cataphoric current, shows how intimately electric phenomena are associated with ordinary osmosis.

FIRST DAY—EVENING SESSION.

"Stable Electrodes. Old Materials Newly Arranged."—By Dr. R. J. Dunn, of Savannah.

The author said that for high tension currents moisture is essential, and the best electrode would be one, which, while convenient to handle, would at the same time bring the largest amount of water in contact with the skin. The electrode which he devised is made out of 40 or 50 pieces of lint, cut of the desired size and made into a pad about one and a half inches thick when wet. The pieces are held together by a loose stitch; if the stitch be drawn tightly, an indentation will be produced, which is not desirable. It is better to cover the pad with chamois leather. The whole is very thoroughly wetted, and connection is made through a large and very pliable metal plate. If the pad be pressed firmly against the skin by means of a bandage, a larger amperage might be employed.

DISCUSSION.

Dr. Massey has not yet found an electrode equal to one properly made out of fine white china clay. The alkalinity of the clay was also an advantage, as it lessened the resistance of the electrode itself. He had also gotten good results from pads of thin cheese-cloth with some elastic material like cotton or wool. Instead of using a metallic plate, he employed a flat wire spiral. There is a decided difference in sensation with even the best electrode, if the surface be well moistened with a good lather of soap.

Dr. Mosher, of Brooklyn, said she wished again to speak of the advantages of her Indian meal electrode. The softer variety of meal is cooked, and placed while hot in a double cheese-cloth bag of the size of the metal plate, and then this "poultice" is applied to the abdomen for a few minutes before the introduction of the internal electrode. If pressure is desired, a small sand-bag is laid upon the electrode. With this device a very heavy current can be employed with but little discomfort to the patient. Where lighter currents are used, she employed an electrode made out of from four to ten layers of cotton flannel, placed evenly over the surface.

Dr. Anna Galbraith, of New York, said that in the Orthopedic Dispensary she was accustomed to use wire gauze, wrapped up in a number of pieces of flannel, and fastened tightly to the part by a belt.

Dr. Goelet thought he had solved the problem of the clay electrode. The clay of the consistence of putty is first made into a flat cake, then covered with "lintine," which is compressed cotton batting; it is then covered with absorbent gauze, and backed with sheet rubber. They can be made of any size desired. This electrode is thoroughly wetted, and placed upon a zinc vessel containing warm water, and is thus kept warm until wanted for use. They can be washed off with soap after being used as readily as washing the hands, or they can be bleached with peroxide of hydrogen.

Dr. W. F. Robinson, of Albany, said that for currents of moderate intensity he had found nothing equal to the wire gauze covered with flannel, or with cotton batting.

Dr. Rockwell kept the clay in a large mass, having a hole in the center filled with water. When wanted for use, a portion is taken, kneaded well, wrapped in a towel, and rolled to the proper size. Where currents of over 100 milliamperes are required, this electrode should be covered with gauze or tarlitan, and in winter a warming pan should be used.

Professor Houston suggested that the addition of graphite would greatly increase the conducting power of the electrode.

Dr. Massey was not favorably impressed with this suggestion, because it would make the electrode very dirty, and more particularly, because it would make the transfer from metallic conduction to electrolytic too sudden. He covered the clay with a lead plate, cut in the shape of a Maltese cross, and where there were scratch marks or pimples, that portion of the plate over them was raised. The most perfect electrode, probably, would be a piece of fresh meat.

Dr. Masher used a glass microscope slide, which she slipped in between the plate and any specially sensitive spot.

Dr. Nunn, in closing, said that he had found the electrode which he had described more convenient for office work than the clay. The object of the chamois leather was to take the place of an animal membrane, many of which he had tried and found objectionable for various reasons. Where there are scratch marks or sensitive spots, he protects these with small bits of rubber tissue.

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"The Value of Voltaic Alternatives in Optic Nerve Atrophy," by Dr. C. Eugene Riggs, of St. Paul (read by title).

"Some Phases of Neurasthenia and their Treatment," by Dr. W. F. Robinson, of Albany.

The paper was devoted chiefly to a consideration of *cerebral* neurasthenia. In this form, *depression* is the prominent symptom and furnishes the key note to the treatment. The author thought neurasthenia could be better treated by galvanism and Franklinism combined than by either one alone, but he did not wish to be understood as advocating electrical treatment to the exclusion of all other therapeutic measures. He laid special stress upon the importance of a general systemic action of the current, and of separating the poles widely so as to secure the proper diffusion of the current. He usually began the treatment with the "static charge" for about three minutes at each sitting. In occasional cases static electricity either has no effect or else produces unpleasant symptoms, such as dizziness and headache. Where galvanism is employed, five to ten milliamperes may be used to the spine daily. The constant current should be used at the beginning, as being less irritating; later on, one can safely pass to the interrupted current, which is one of the best of vital stimulants.

Dr. Massey said that in considering the treatment of neurasthenia, one should never forget the important part played by the alimentary canal. After commenting upon the good effects which he had seen follow the employment of the laborious Weir-Mitchell treatment by faradization of individual muscles, he said that he had found the treatment could be greatly shortened and simplified and with equally good results by having the patient lie on a large positive electrode, and then with a current sufficient to cause vigorous contractions rub the negative electrode all over the accessible portions of the surface of the body.

Dr. Rockwell said that the author had cautioned against sudden changes, yet he advised going from the static electricity to the galvanic. These two forms of electricity were as far removed from each other as possible; the faradic current would have been an intermediary one, and where systemic effects are desired, he thought the faradic current gave the best results.

Dr. Hutchinson did not approve of the very small dosage advocated in the paper; the current should be as strong as can be used and applied near the nerve centers. All workers in this field are endeavoring to secure the systemic effects, and while the results are good from electrical treatment, it is very slow.

Dr. Anna Galbraith remarked that she had a lady patient who had previously submitted to the Weir Mitchell treatment, but found the galvanic treatment much more pleasant.

The President said that the author had been so cautious in his dosage as to almost tell us how *not* to give electricity. Personally, he always felt he could not give enough, and that the skin was the chief barrier to success.

The association then adjourned to attend a reception tendered them by the Electric Club, of New York, and a very pleasant evening was spent in inspecting the home of this club. An elaborate supper was spread in the ample parlors of the club and everything done to make the evening enjoyable.

*(To be continued.)*

## Diphtheria and the Galvano-Cautery.

The *Deutsche-Medizinal Zeitung*, of January, 1892, prints an article by Dr. F. Bloebaum, wherein is given a full account of his successful treatment by the use of the galvano cautery; also reviews the present theories about and generally accepted remedies for the disease. He is strong in his statements by saying that it satisfies every requirement in the treatment of diphtheria, and accomplishes results which far surpass those obtained by any other mode in vogue.

Upon what ground does he rely in making those statements? By its use the false membrane, with its deadly bacilli, is burned off and does not reform. Then no bleeding occurs, due to the astringent property of heat. The fever diminishes in three hours, and the normal temperature is resumed in 24 hours. From these points gained the facts show, as he used no antipyretic and anthitheric remedies, the healing power of the current. There could be no reabsorption of septic products after the cauterization. Any swelling of the parts before and after the operation rapidly diminish. By the irritation in the smaller parts thus made, brings about a barrier against the invasion of ichorous pus by this caustic, and the new vascularization is brought about and hastens demarcation. Bloebaum's claims are clear enough, "that by the use of the cautery all indications are with one stroke made favorable, for the malignant diphtheritic swelling is infallibly transformed into a benign burn." Therefore his claim and belief, through his reasoning and experience, has found the key to the specific.

When an investigator and experimenter tabulates 40 cases of diphtheria treated by his method, and of these only one proved fatal, which was due to deferred treatment, as he himself says, that his caustic application must be used early when there has been only a small portion of the deadly poison given off by the bacilli, and also reminds you that it can only be useful when all the diphtheritic patches can be cauterized and thereby sterilizing the parts; that is to say, when the patches are all confined to the tonsils, the anterior and posterior walls of the soft palate, the uvola and posterior pharyngeal wall; in short, all places where diphtheritic patches generally arise first. We can agree with such an honest, clear opinion and the great value of the cautery. But the use of this method must not be attempted by those who are not versed in the general principles and technique of the application of the galvano-cautery. While it is a great remedy in the hands of the practiced, it is as dangerous as it is heroic int he hands of the novice. Nevertheless, this ought not to scare away the timid surgeon. It requires good judgment, the pick of cases. There is one ghostly apparition which will and does often present itself to many practitioners. That is the question of differential diagnosis. Between this and many conditions of the throat, either alone or concomitant with other diseases, this must be always taken into consideration before the galvano cautery is applied in a haphazard fashion, or more harm will be the outcome from a really good treatment instead of benefit.

The galvano cautery is undoubtedly a successful remedy. Hagedore agrees with this author regarding the treatment, and makes the same statement when and where, and in what case the cautery should be applied, in order to gain a successful issue. His after treatment of the escar by the use of powder of a non-poisonous order (*Dermotol*) or with aniline dies—haxamethyl-violet, hexethyl-violet, or methylene blue. All must be recommended in the treatment of this disease especially in children of tender ages. We all know that more children are sacrificed by the many different drug modes of treatment and handling, when perhaps the most simple house remedy would have resulted in recovery. Lisnin serves to recall the difficulty of finding an antiseptic in all our category which will destroy the bacilli without harming the organism. His list of deaths due to the use of these remedies ought to be a warning to us in using them perniciously, and the adoption of such methods which will insure us more safety.

We must also not forget to remind the author and his followers of the many difficulties that beset the application of the cautery in children, and that often force and agage or anæsthetic will be necessary in order to bring it to a successful issue. Should it become necessary to apply an anæsthetic, nitrous oxide gas would be the choice on account of its advantages in its after effects. The knives for making the escar must be of a large pattern which will involve by two burns and take in the entire surface, and made of many wires instead of one flat piece of platinum. BLEYER.

## New York Electro-Therapeutic Society.

A regular monthly meeting of the Society was held at the residence of Dr. Goelet, 351 West Fifty-seventh street, on Friday evening, November 11. The subject discussed was "Contributions Upon the Future Possibilities of Electricity in Medicine." Some interesting demonstrations with the secondary induced current were also made. The meeting was attended by most of the resident members of the Society.

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An electric power plant, to cost $500,000 is being put in at Nevada City, Cal., by private parties.

Plans for the new power house of the Germania Electric Company at Marlboro, Mass., are in the hands of the builder, and as soon as possible it will be got in order for the reception of the new steam power plant, the engine of which is to have a capacity of 300 horse-power.

The Hobson, Texas, Electric Light and Street Car Company has made preliminary arrangements for the construction of a dam across the Brazos river near Towash, 12 miles above Waco. The purpose is to convert the water power into electricity, operating the lights and street car service. It will involve the outlay of $100,000.

# ADVANCE INFORMATION.

*New Electric Companies Formed and Important Constructions Projected.*

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week:

### New Electric Railways.

DENVER, COLO.—The Phœnix Tramway Company, capital, $200,000, will operate in Arapahoe County, Colorado, and Arizona Territory, with principal office at Denver. Directors, John S. Macbeth, Frederick Robinson, Jr., Henry B. Robinson, Granville Malcom and George M. Harris. Object, to build, construct and maintain street railway companies.

TORONTO, ONT.—The Toronto Electric Street Railway Company contemplate the erection of a $30,000 car house. The structure will be of red brick and stone.

DETROIT, MICH.—The Detroit Suburban Railroad Company, D. M. Ferry, M. S. Smith, W. W. Cook and others, incorporators, has purchased the East Detroit and Grosse Pointe Railroad, the Gratiot Avenue Railroad and the Detroit Electric Railroad. Bonds to the amount of $400,000 will be issued for the purpose of extending and equipping with electricity the roads absorbed.

GUTHRIE, OKLA.—The Guthrie Electric Railway Company; capital stock, $75,000. Directors, William D. Ford, Pittsburg, Kan.; L. West, L. F. Laferty, W. C. Guss and E. M. Ross, Guthrie.

HUNTSVILLE, ALA.—Right-of-way has been granted by the city for a street car line.

CHARLESTON, ILL.—The Charleston Street Railway Company; capital stock, $100,000. Incorporators, Murat W. Hopkins, James K. Rardin and J. W. Neal.

MONTPELIER, VT.—The State Legislature has passed bills incorporating the St. Albans Street Railroad Company, of St. Albans, Vt., and the St. Johnsbury Street Railway Company, St. Johnsbury, Vt.

BRIDGEPORT, CONN.—The Bridgeport Traction Company will in a few days advertise a petition to the legislature for a charter to run cars to the suburban districts. The company will use the trolley system.

STILLWATER, N. Y.—A rumor is current that outside parties have been making an effort to purchase the Stillwater and Mechanicville Street Railway, and run it by electricity.

PHOENIX, ARIZ.—Money to the amount of $25,000 has been deposited in the banks here, to begin work on the new electric belt line to extend to the Arizona Falls.

LAFAYETTE, IND.—A new street railway and power company has been organized. The new company proposes to utilize the plant of the old Lafayette car works, a portion of it for power and the balance to be devoted to the building of street cars.

ATLANTA, GA.—The Metropolitan Street Car Line has been sold at auction to Boston capitalists for $121,000. It is reported that the actual buyer is the Old Colony Trust Company, of Boston.

TAHLEQUAH, IND. TER.—The citizens of this place are elated over the prospects of securing an electric railway. The road is to be operated between Tahlequah, Port Gibson and Wagner, connecting with the Missouri, Kansas & Texas at Wagner.

### Electric Light and Power.

LITTLE FALLS, MINN.—People's Gas and Electric Company, of Little Falls; capital, $50,000. Promoters, P. H. Gross, J. C. Flynn, C. J. Hains, J. Wetsil, J. Nestor, J. W. Berg.

WARSAW, N. Y.—Warsaw Gas and Electric Company; capital, $50,000. Promoters, George C. Otis, Moses G. Rowe, Elbert E. Farman.

BROCKVILLE, ONT.—In order to meet the increased demands for electric light, the Brockville Electric Light Company has decided to purchase additional machinery and otherwise enlarge the plant at a cost of several thousand dollars.

KOKOMO, IND.—Articles of incorporation have been filed with the Secretary of State by the Citizens' Light and Power Company, of Kokomo; capital, $50,000.

MARLIN, TEX.—The Marlin Electric Light and Ice Company has been organized with a capital of $30,000.

SAN RAFAEL, CAL.—At a special meeting of the Board of Supervisors of Marin County, held recently, M. G. Elmore and C. B. Greene, of San Francisco, were granted a franchise to erect an electric light plant at Saucelito.

LITTLE ROCK, ARK.—The Consumers' Light and Power Company, of Little Rock, has filed articles of incorporation, with a capital of $200,000, of which $75,000 is paid. The incorporators are B. E. Sunny, B. J. Arnold, G. Martin, of Chicago; George R. Brown and H. G. Allis, of Little Rock.

SACRAMENTO, CAL.—The Sacramento Electric Power Company. Directors, Albert Gallatin, A. J. Ralston, Horatio P. Livermore, Charles E. Livermore and Joshua Barker. The amount of the capital stock is $1,500,000, and $600,000 worth of stock has been subscribed. The company proposes to furnish light and power to the inhabitants of Sacramento, and also to construct a street railroad to run from the passenger depot of the Southern Pacific Company to the eastern boundary of the city. The estimated length is 16 miles.

WINONA, MINN.—The Northwestern General Electric Company, which, under the name of the Winona Light, Heat and Power Company, has a franchise to put in an electric plant here, has purchased the plant of the Winona Electric Light Company, which will be enlarged and improved and new buildings erected. The power plant of the electric street railway will be located in the same building. It is stated that the Northwest Company is contemplating similar consolidations in other cities.

DARLINGTON, S. C.—The Darlington Light and Power Company, previously mentioned as incorporated for the purpose of operating electrical apparatus of all kinds, has been organized with J. J. Ward, president; J. C. Wilcox, vice-president; J. L. Mitchel, secretary. The capital is $10,000.

HAZLETON, PA.—The Lehigh Traction Company; for supplying motive power to street railway companies; capital stock, $10,000.

LYNN, MASS.—The Woodward Underground Electric Light & Cable Company has been granted a franchise to construct and maintain its underground system in this city.

BINGHAMTON, N. Y.—The Binghamton General Electric Company has completed arrangements to transfer its machinery from Noyes Island to the plant in Court street. It is proposed to enlarge the Court street structure by extending the building 60 feet and raising the whole building another story.

CHARLEROI, PA.—The Charleroi Electric Light Company is making arrangements to go ahead with the building of its plant.

ALAMEDA, CAL.—The trustees have decided not to sell the city electric light plant, but will improve it by an expenditure of about $6,000.

JEFFERSON CITY, MO.—This city has voted on an electric light proposition, which was carried by a large majority. The Jefferson City Gas Light, Heat and Power Company will put in the plant.

PITTSFIELD, MASS.—The Pittsfield Electric Company is about to add $10,000 worth of machinery to its plant.

MONONGAHELA CITY, PA.—The Electric Light Company will enlarge its plant to double its present capacity.

### New Manufacturing Companies.

CLINTON, ME.—A corporation was organized at Clinton, November 1, under the name of the Bradford Self-Closing Telegraph Key Company, with a capital of $500,000. The officers are as follows: President, Chas. W. Bradford; secretary, Forest J. Martin; treasurer, Howard W. Dodge. Directors, C. W. Bradford, E. G. Hodgdon, W. T. Haines, H. S. Goodwin, A. A. Shaw, H. W. Dodge, F. J. Martin. The purposes of the corporation are the manufacture of a certain patented invention known as the automatic circuit closer for telegraph keys, invented by Chas. W. Bradford, of Clinton, Me. By the use of the key the annoyance and delay from operators leaving the ordinary key open is entirely obviated. The key has been examined and tested by leading operators and is strongly endorsed by them.

PERU, IND.—Articles of incorporation have been filed by the Peru Electric Manufacturing Company, of this city, with a capital of $100,000, for the manufacture of electric appliances, such as carbons, insulators and the like. The stock is taken by home capital, and the industry, when in full running order, will give employment to 200 persons.

LANCASTER, PA.—The Lancaster Carbon Company, of Lancaster, Erie County, has been incorporated to manufacture electric carbon points and other electrical appliances and apparatus; capital, $35,000. Directors, A. Cant, R. J. Getz, W. C. Hodge, C. E. Williams and J. T. Gard.

CHICAGO, ILL.—Kennedy Electric Company; capital, $100,000. Incorporators, Herman R. Powers, Snyder Grans, Frederick Arnd.

### Telephone and Telegraph Companies.

CHICAGO, ILL.—Dzienny Telegraph Company; capital, $20,000. Incorporators, M. S. Cylorowski, J. Groszkiewicz and John Tarkowski.

SACRAMENTO, CAL.—The Sunset Telephone and Telegraph Company; W. D. Comstock, president; has been granted a franchise for 50 years to build a telephone system in this city.

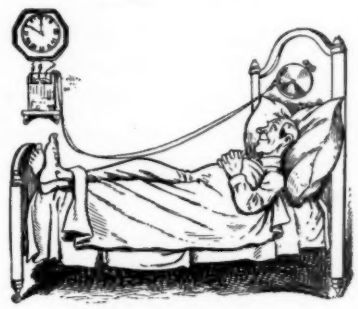
### Increase of Capital Stock.

HELENA, MONT.—The stockholders of the Helena Electric Company have increased the capital from $100,000 to $300,000.

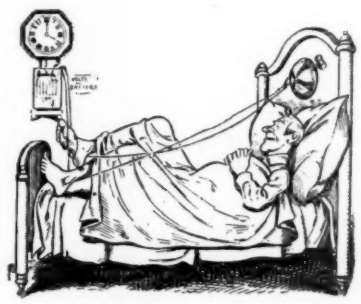
CHICAGO, ILL.—The Northwestern Electric Light and Power Company has increased its capital from $35,000 to $50,000, and the number of its directors from three to five.

## CROSSED WIRES.

[FROM NEW YORK LIFE.]



Professor Volt, the electrician, has perfected an ingenious device to supplant the old-fashioned alarm clock. He knows he will be awakened at six.



Being a restless sleeper, his feet become entangled in the wires.

But he was awakened at six.

## TELEPHONE CHAT.

Brownwood, Tex., wants a telephone system.

A telephone line is to be constructed between Warsaw, Pavilion and Le Roy, N. Y.

A telephone is now in operation between Bodie and Hawthorne, Nev., a distance of 37 miles.

It is expected that the Nebraska Telephone Company will extend its lines so as to connect Kearney and Lincoln.

Only $30,000 of the $500,000 proposed bond issue of the Erie Telegraph and Telephone Company will be sold now; the remainder being held till 1894, and sold if it is found that more funds are needed for further metallic circuits.

Another effort is being made to get a telephone line through Seneca county, N. Y. The Empire State Telephone Company has offered to build a line from Seneca Falls to Ovid for $1,200, and an effort will be made to raise this amount. Bearytown has promised to give its proportion.

The latest method of starting street cars in Denver is said to result in a saving of at least 80 per cent. over the cost of the ordinary system. The difficulty of maintaining schedule time with a large number of cars is well recognized, and on many lines if a car be delayed by an accident for a quarter of an hour or 20 minutes the whole line will be so demoralized that schedule time will not be overtaken during the whole day. In the city of Denver there are 74 miles of electrical and 13 miles of cable tracks, requiring 103 trains in daily operation. To obviate the inconvenience which a breakdown of any kind inevitably causes, a system of telephone circuits has been arranged, with various call points, all communicating with the head office. Every conductor on arriving at the terminus of the route immediately reports the number of his car to headquarters and receives in reply his proper leaving time and any instructions that may be necessary. The dispatch clerk is in this way advised of the whereabouts of each car and is very often enabled to fill up a space of from 30 to 60 minutes caused by a "parade." The saving of starters at the various termini is taken as a set-off against the expense of the telephones.

## KINDRED INTERESTS

**The Central Electric Company,** Chicago, report the heaviest sales for Okonite wire in the month of October that they have ever experienced. The demand for high-class goods seems to be daily increasing, and they are decidedly convinced that the cheap makes of supplies of all kinds will soon be forced out of the market, as consumers are waking up to the fact that permanency is the essential point in electrical construction. The Washington carbons are finding a ready sale, several of the largest companies throughout the country having contracted with the Central Electric Company for all the carbons they use. They report having several handsome orders for large construction jobs, and feel convinced that the next two months will be very busy ones.

### Mather Apparatus for the New "Herald" Building.

Mr. Paul T. Kenny, whose offices are in the Bennett building, at Nassau and Fulton streets, this city, has been appointed special agent for the Mather Electric Company, of Manchester, Conn. His first month's sales show that he is a valuable addition to the working forces of the latter company. Mr. Kenny has just secured the contract for equipping the New York *Herald's* new building with Mather dynamos and motors. The contract at present calls for four 450 ampere Mather compound wound dynamos, one 40 horse-power and two 20 horse-power Mather motors, besides other apparatus to be decided upon later. The presses in the new *Herald* building will be located on the ground floor in plain view from the street, and will all be operated by electric power. Mr. Kenny will devote his personal attention to the installation of this plant, and will try to make it a model equipment. Other orders for Mather motors secured by Mr. Kenny during the past month are as follows: J. B. Hoecker, optician, 586 Fulton street, Brooklyn, one horse-power; Thos. F. Larkin, printer, 284 Fulton street, Brooklyn, three horse-power; Jennings Lace Works, Brooklyn, 15 horse-power; Chas. H. Jones & Company, printers, 114 Fulton street, New York, 10 horse-power.


**RAILS,** OLD OR NEW, STEEL OR IRON

We sell new, first quality, steel T rails of all weights and have in stock 132 tons of new, first quality, 50 lb. steel at a bargain, and Spikes, Splice Bars and Bolts for laying. We also deal in selected second-hand Rails and now have for sale the following, all of which are in good condition to relay:—20 tons 20 lb. steel and 450 tons 20 lb. iron for Penna. delivery, 600 tons 60 lb. steel for New York State delivery.

☞ We want to buy Rails fit to relay and Scrap Rails.

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**HYDRAULIC PRESSES,**
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Special Attention to Electrical Work.

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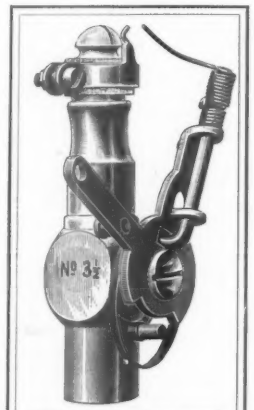
. . . GAS BURNERS . . .

**The By-Pass Ratchet Burner No. 3½**

. . . . . WE HAVE RECENTLY PRODUCED THIS IMPROVED RATCHET GAS BURNER, WHICH WE TAKE PLEASURE IN OFFERING THE ELECTRIC HOUSE-FITTING TRADE FOR EXAMINATION AND TRIAL.

**FIRST.....** **Only one contact is made** in four operations of the movable arm forward and back **to light and extinguish the gas.**

**SECOND.** This not only saves fifty per cent of the battery power, **but preserves the wipe spring from heat and smoke,** and so prevents grounds at the **contact points, which are** always kept clean.



NEW BY-PASS RATCHET BURNER
No. 3½.
CUT FULL SIZE.
Pat. Mar. 2, 1880, and April 2, 1880.

**THIRD....** The No. 3½ is smaller than the bulb Ratchet burner, but has an amply large gas-way, into which is inserted a **perfect working gas-check, which prevents hissing.**

**FOURTH.** It will interest users to find a ratchet hand-lighter whose movable electrode cannot be held in the flame until softened and robbed of its tension. Please note that the electrode is **not** lifted over the fixed one **through the flame,** but passes under and **out of the flame** instead.

**THE NEW BY-PASS RATCHET BURNER** is an improvement upon, and is designed to take the place of, our old Nos. 7 and 11, and we feel sure it will not fail to give the greatest satisfaction to users.

Our Gas-lighting Apparatus is popularly known to be thoroughly constructed after the most practical and popular designs, and nicely finished in all required styles.

**This New Burner** is offered at the same prices as our popular No. 3 Bulb Burner. We cordially invite correspondence from electrical house fitters and contractors everywhere. Address

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Artistic Metal Workers.
Brass, Iron and Wire Office-work.
Railings, Crestings, Nettings, etc.
Everlasting Cemetery FENCES.
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**IF YOU** have anything pertaining to electric machinery you want to sell, send us the description.
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Platinum in sheet and wire, all sizes, and any degree of hardness. Scrap and native platinum purchased.

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OF PATTERN LETTERS AND FIGURES IN STOCK,
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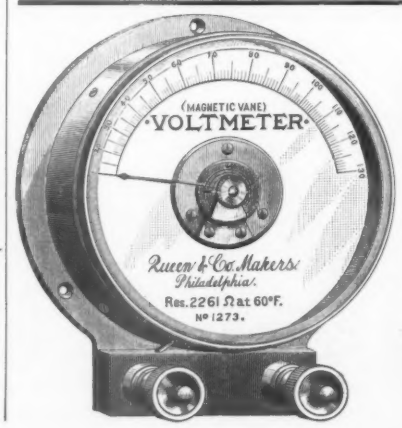


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